IMPROVING THE TEACHING OF STATISTICS ,MATHEMATICS AND COMPUTERS

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1.Introduction

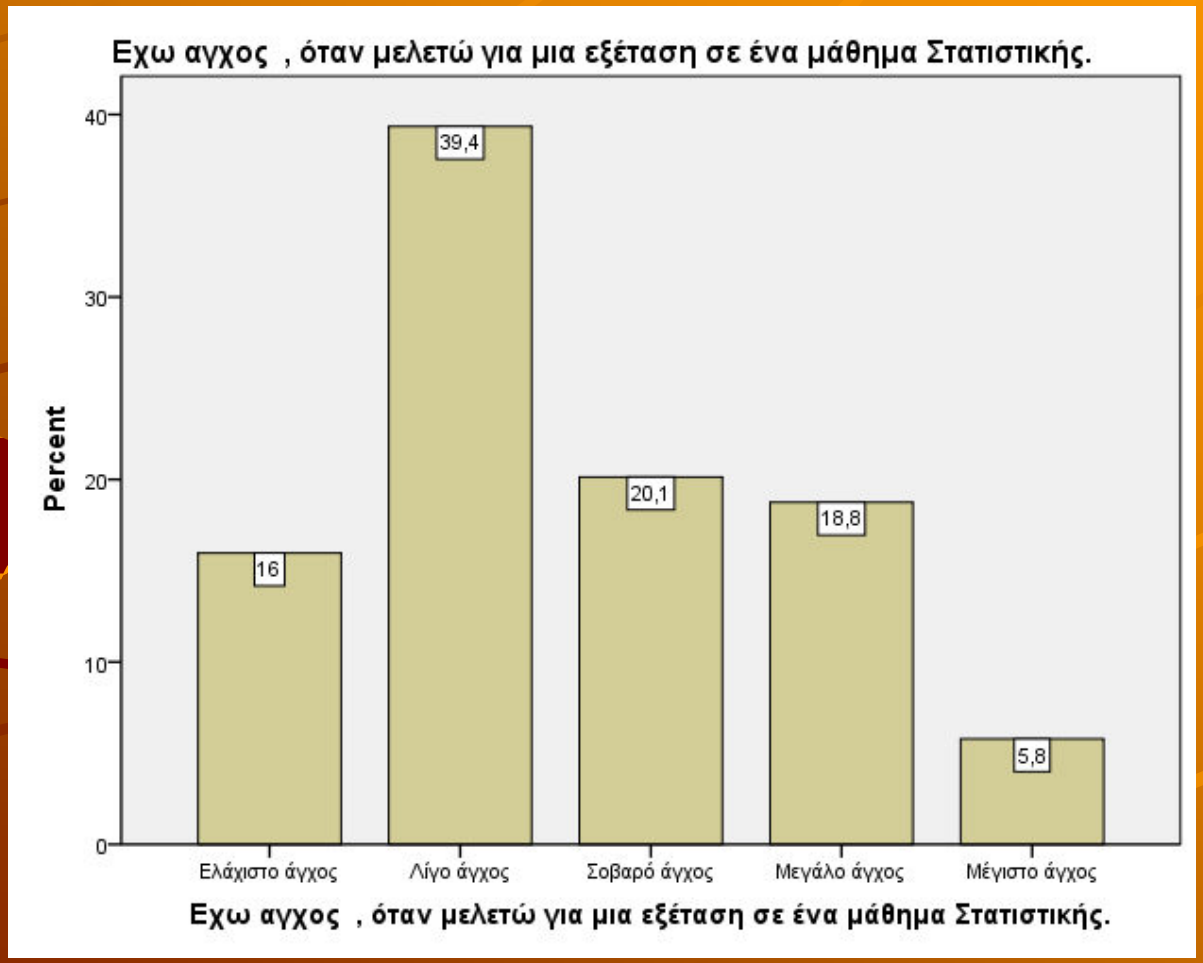
- In this paper, we present the results of a survey between the students of the “so called” quantitative courses of Statistics,Mathematics,Financial Mathematics and Computers.

- The aim is to investigate the factors which contribute to the Anxiety of the students studying the above courses with the final goal to improve the teaching by eliminating the effect of these factors.

2. Identity of the survey

- The survey was carried out between
- 208 men and 231 women with mean age 24,48 years and standard deviation 6,2 years

Indicative bar charts and some lessons
anxiety factors from Statistics



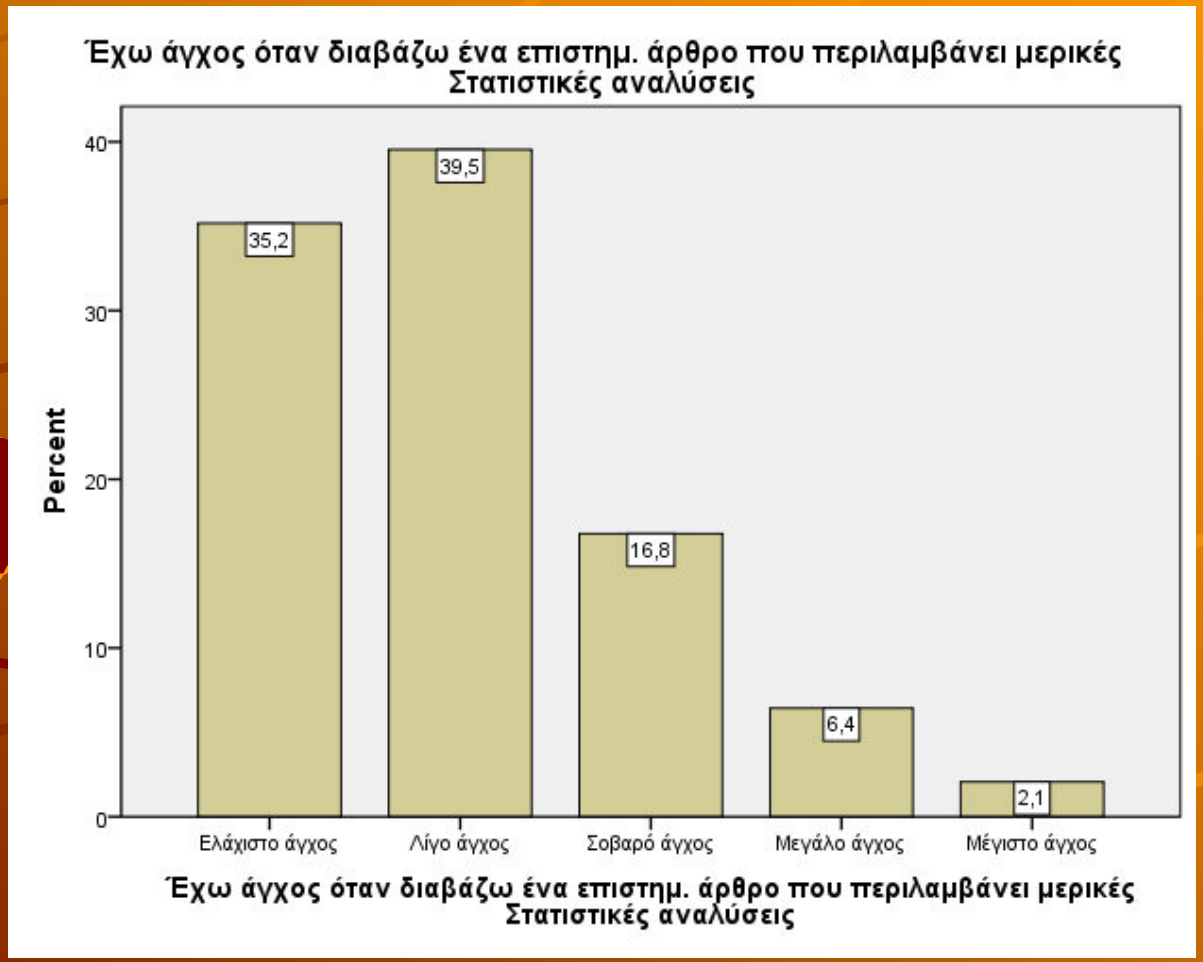
- Lesson 1:
- Books of Statistics must be written in simple language and they must contain many solved examples


Εχω αγχος όταν προσπαθώ να αποφασίσω ποιά Στατιστική ανάλυση είναι κατάλληλη γιά τη ερευνητική μου μελέτη
Percent
40
30
20
10
0
24
36,6
22,8
11,5
5,1
Ελάχιστο άγχος
Λίγο άγχος
Σοβαρό άγχος
Μεγάλο άγχος
Μέγιστο άγχος
Εχω αγχος όταν προσπαθώ να αποφασίσω ποιά Στατιστική ανάλυση είναι κατάλληλη γιά τη ερευνητική μου μελέτη

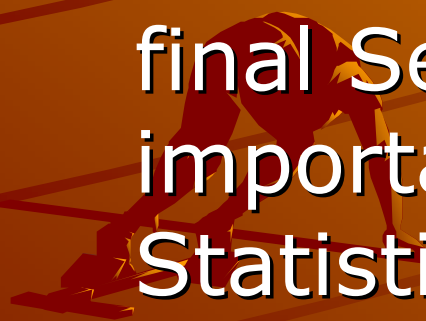
- Lesson 2:
- Every statistical book must have a flow chart with the different uses of statistical tools in every situation of data, e.g. use of Probability, Distributions, Tests of Hypotheses, Regression, Analysis of Variance.


Εχω άγχος όταν ερωτώ κάποιον στο εργαστήριο Ηλεκτρ. Υπολογιστών να με βοηθήσει
Percent
50
40
30
20
10
0
44,4
36,7
12,1
5,6
1,2
Ελάχιστο άγχος
Λίγο άγχος
Σοβαρό άγχος
Μεγάλο άγχος
Μέγιστο άγχος
Εχω άγχος όταν ερωτώ κάποιον στο εργαστήριο Ηλεκτρ. Υπολογιστών να με βοηθήσει

- Lesson 3 :The teaching Staff of the Statistics and Computing Labs and the Professors who teach theoretical Courses in Statistics, must be knowledgeable ,friendly and very helpful to the students.


Έχω άγχος όταν διαβάζω ένα επιστημ. άρθρο που περιλαμβάνει μερικές Στατιστικές αναλύσεις
Percent
40
30
20
10
0
35,2
39,5
16,8
6,4
2,1
Ελάχιστο άγχος
Λίγο άγχος
Σοβαρό άγχος
Μεγάλο άγχος
Μέγιστο άγχος
Έχω άγχος όταν διαβάζω ένα επιστημ. άρθρο που περιλαμβάνει μερικές Στατιστικές αναλύσεις

- Lesson 4: The courses of Methodology of Research, Seminars in SPSS and Statistics and the Research Project of students in the final Semester, are of immense importance for understanding the Statistical concepts and the method of reading and writing a research article.



3. Contingency tables Analysis

Results obtained in SPSS WIT THE COMMAND

: CROSSTABS

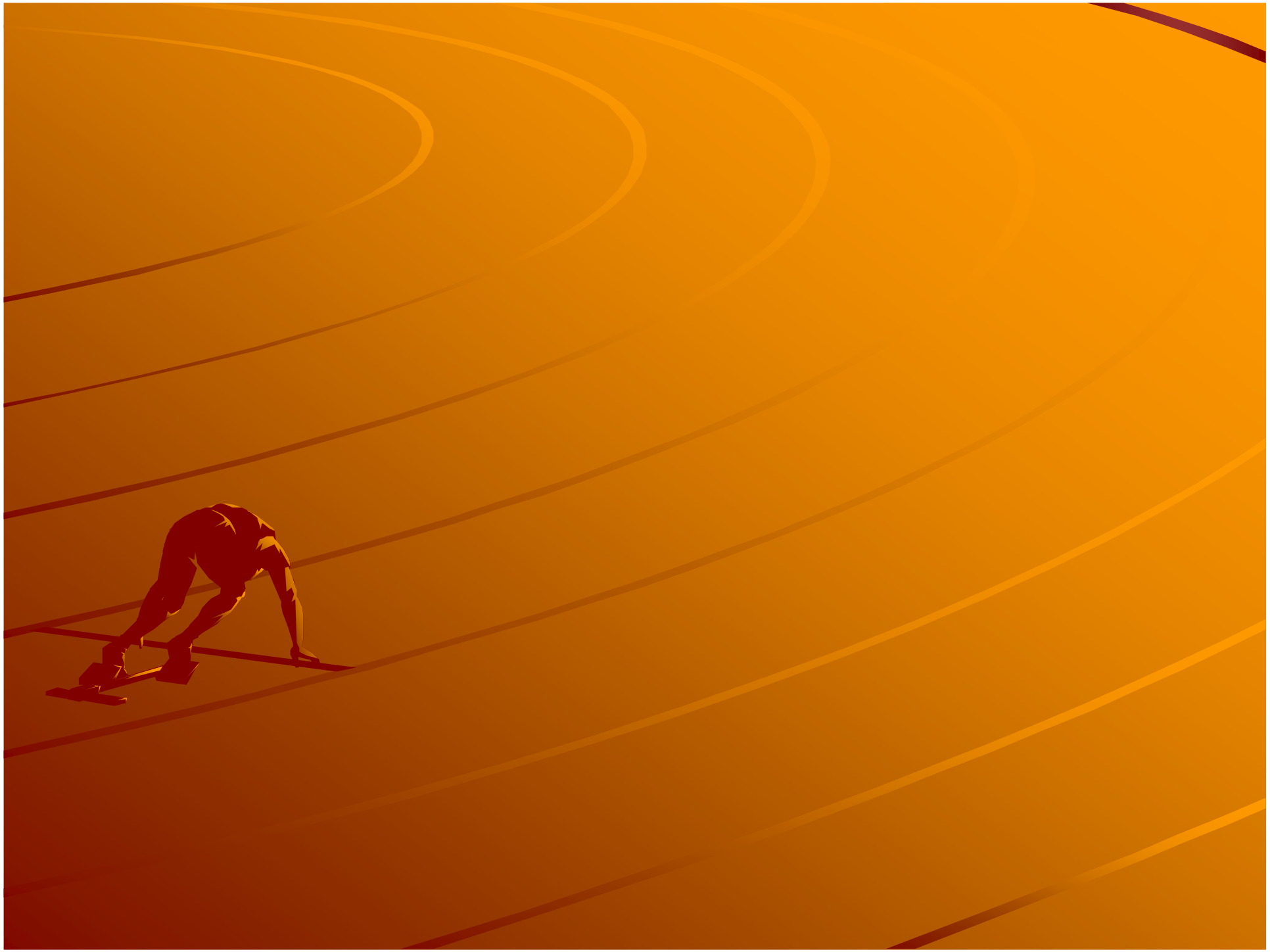
Crosstab

		Έχω άγχος όταν ερμηνεύω τη σημασία μιάς τιμής πιθανότητας πού μόλις τη υπολόγισα					
		Ελάχιστο άγχος	Λίγο άγχος	Σοβαρό άγχος	Μεγάλο άγχος	Μέγιστο άγχος	Total
Τι φύλο είσαι ; ΑΝΔΡΑΣ	Count	65	89	30	14	7	205
	% of Total	15,0%	20,6%	6,9%	3,2%	1,6%	47,3%
ΓΥΝΑΙΚΑ	Count	45	96	45	26	16	228
	% of Total	10,4%	22,2%	10,4%	6,0%	3,7%	52,7%
Total	Count	110	185	75	40	23	433
	% of Total	25,4%	42,7%	17,3%	9,2%	5,3%	100,0%

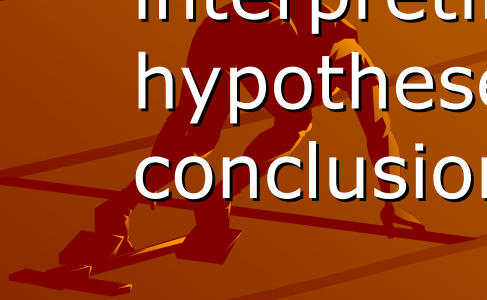
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12,837[a]	4	,012
Likelihood Ratio	12,993	4	,011
Linear-by-Linear Association	12,250	1	,000
N of Valid Cases	433		

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 10,89.



- From the above $\chi 2$ test we conclude that gender and anxiety in interpreting statistical results are dependent. Men have higher anxiety than women in interpreting probabilities,tests of hypotheses and other statistical conclusions



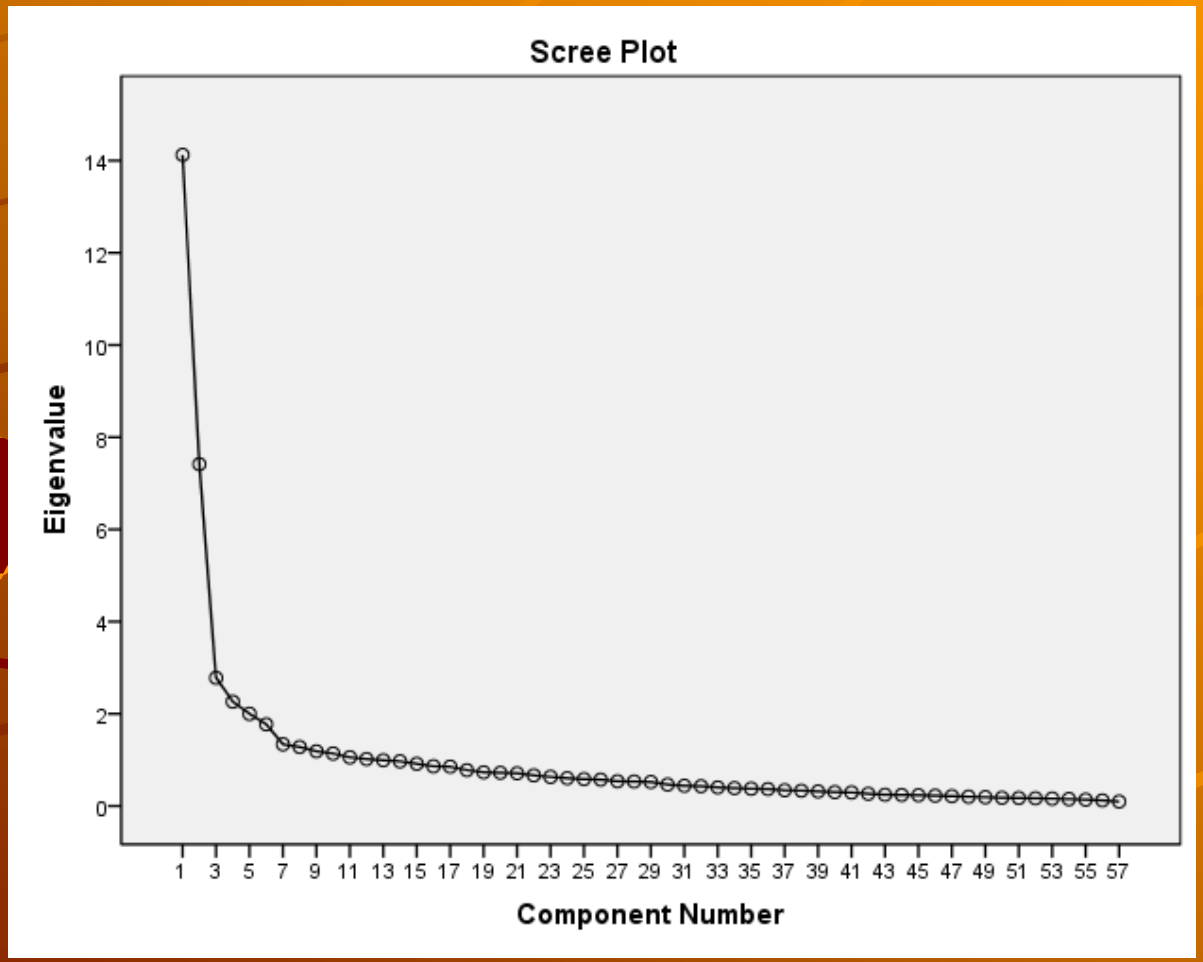
- Similarly,gender and anxiety when
- (i) asking teachers in statistics,
- are dependent (p-value<0.005+
- (ii)examination in statistics,
- are dependent (p-value<0,01
- (iii) choosing the righjt statistical tool in a particular data situation ,
- are dependent (p-value<0,05

4. FACTOR ANALYSIS OF THE ANXIETY IN STATISTICS

- We perform an exploratory Factor Analysis to find the different dimensions of anxiety
- We find the following results:

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,900
Bartlett's Test of Sphericity	Approx. Chi-Square	11287,422
	df	1596
	Sig.	,000


Scree Plot
Eigenvalue
14
12
10
8
6
4
2
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57
Component Number

There are 7 factors which explain 55% of total variance

- **The factors are:**
- 1.Study and applications of Statistics
- 2.System of beliefs about Statistics, the teachers of it and its usefulness.

- 3. Examination in Statistics
- 4.Intellectual background in Statistics,Mathematics and Computers
- 5.Category of High School
- 6.Age
- 7. Highest title of studies obtained

5. Coefficient Cronbach's ALFA

- The questionnaire consists of the following three sections apart from the demographics :
- 1.ENDOGENOUS VARIABLES.Uses of EXCEL,SPSS,STATISTICS AND COMPUTING PACKAGES. M.HSU.
- Cronbach's alfa=0,94

- 2. Statistics-Computers. EXOGENOUS VARIABLES. Hanna et al.
- Cronbach’s alfa=0,80

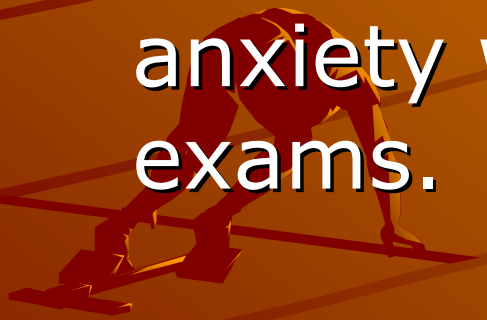
- 3. Factors which contribute to ANXIETY FROM Statistics
- Cronbach’s alfa=0,94

6. Multinomial Logistic Regression

- We performed a multinomial Logistic Regression with dependent variable:
- Anxiety during the study of Statistics.
- The independent variables are:
- 1. type of high school(unified(enieo),EPAL,EPAS
- 2.SCIENTIFIC DIRECTION OF HIGH SCHOOL(KATEUTHINSIS)
- 3.Study of Maths during the last year of high school
- 4. Study of statistics during the last year of high school
- 5.Attendance of a computer lab in the University before the study of Statistics

- 6.Knowledge of basic Mathematical and Statistical functions of MS EXCEL and SPSS.
- The results show that the full model containing all predictors was statistically significant
- X2=396,29, df=340
- P-value=0,019<0,05

- The above results indicate that the model was able todistinguish betueen respondents who reported and did not report that they had anxiety when studying for statistics exams.



- The model as a whole explained between 17.3% (Cox and Snell R-Squared) and 19,0% (Nagelkerke R-Squared) of the Variance in Anxiety Status and correctly classified 94% of people who had some anxiety when studuing Statistics.

- The following three independent variables made a unique statistically significant contribution to the model:
- 1. type of High School
- 2. Study of Statistics in the last year of High School
- 3. Study of Mathematics in the last year of High School

odds ratios

- The strongest predictors recording the highest odds ratios were the
- First and second variable.

Conclusions

- 1. Men have higher levels of anxiety when they study statistics than women
- 2.The background of the student plays an important role in understanding the concepts of Statistics
- 3. THE TEACHING STAFF IN THE CLASSROOMS AND THE LABS MUST BE HELPFUL AND IT IS IMPERATIVE THAT THEY GIVE CLEAR ANSWERS TO THE QUERIES OF STUDENTS,

7. REFERENCES

- 1.M.K.HSU et al. (2009) Computers in Human Behavior,25, p.412-420.
- 2. D. HANNA et al. (2008) Personality,45,p.68-74.