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DIPARTIMENTO DI SCIENZE ECONOMICHE E STATISTICHE

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SELF-ASSESSMENT AND CAREER CHOICES:
AN ON-LINE RESOURCE FOR THE
UNIVERSITY OF SALERNO

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Abstract

Aim of this paper is to examine the different factors that might influence high school students in their choice of a University degree program and the relationship with occupational interests. In this framework, an on-line questionnaire, "The Self-Assessment and Career Choices scale", has been proposed for the University of Salerno as a service offered by the orientation office in order to investigate the career decision process. In the following, a brief description of the scale is given, along with the main results of the exploratory analysis performed on the data collected during the first year of implementation of the scale on the web.

Keywords:

Self-Assessment, Career Choices, Ordinal Data, Multivariate Data Analysis.

1. Introduction

The Italian university system is currently undergoing an extensive institutional renewal process. A growing interest is being paid to the analysis of the decision process through which “potential” undergraduate students choose a specific academic field. Counselling and psychological services are proposed by the universities for helping subjects to resolve personal difficulties in the career choice process and to develop specific skills, attitudes and interests.

Most of foreign and domestic researches, which describe the career choice process, focus the attention on several variables based on individual characteristics, psychological traits and behavioural aspects, occupational interests, social and academic motivation (Mancinelli, 1998; Adler *et al.*, 1998; Wentzel and Wigfield, 1998; Peterson and Delmas, 1998; Tang and Smith, 1999; Soresi, 2000). These studies are often based on questionnaires or interview data collected through traditional or on-line administration of psychological scale.

In the web survey, widely used in social science and educational research, the on-line questionnaire offers a number of advantages, over more traditional mail and phone techniques, because reduces the time and cost of conducting a survey and avoids the error of data entry (Coomber, 1997). Furthermore, since HTML format can be made programmable, it is possible to have real time error checking which increases the accuracy of the data

collection process. However, since a web survey is restricted only to individuals with access to computer networks, the generated sample is not a random one (Best, 2001).

In this framework, we have proposed an on-line questionnaire, named as “Self-Assessment and Career Choices scale”, endorsed by the University of Salerno as a tool in the orientation program provided for high school students.

The proposed questionnaire assesses personal traits and learning style, on one hand, and gives to the subjects useful suggestions in order to help them to choose the degree program most closely related with their occupational interests, on the other. Therefore, the questionnaire can also be useful to investigate the factors that influence the career choice process.

Aim of this paper is to present the results of the statistical analysis performed on the data collected during the first year of the on-line presence of the proposed scale on the University web site. A multivariate exploratory data analysis was conducted, with the goal to check the one-dimensionality of the chosen factors. Afterward, the relationship between personal traits and occupational interests has been measured to highlight the role of skills, interests, personal traits and values in the career decision process.

The paper is organised as follows. In section 2 the proposed scale is briefly presented. Section 3 shows the results of the multivariate exploratory analysis. Section 4 provides empirical evidence on the relationship among the investigated phenomena. The last section gives some final remarks and concludes.

2. Self-Assessment and Career Choices scale

The questionnaire under analysis was planned as one of the activities in the orientation program provided by the Orientation Office of the University of Salerno (C.A.O.T.)¹, supported by the Schola grant².

One of the goal of this orientation program was to achieve an on-line self-assessment test that could be easily taken by the students interested in enrolling in a degree program. The questionnaire has been realised by a team of researchers, coming from different areas (psychology, sociology and statistics), in order to measure the psychological factors related to the career choices process of high school students. Sections and the number of item were chosen so to take into account the specific on-line nature of the questionnaire.

The first part of the questionnaire aims at collecting information on socio-demographic background and performances in high school, together with some information about their choice of enrollment in a degree program.

The Self-Assessment and Career Choices scale comprises observable indicators (questionnaire's items) in order to measure psychological and personality traits, not directly observable. The Likert scale format—one of the most frequently used for describing the degree of agreement of the answers (Spector, 1992)—was chosen. The subjects have to respond to any statements on a 5-point scale of agreement, where higher scores indicate stronger degree of agreement.

The scale is made up of 107 items divided in two subscales. The first one, Self-Assessment scale, is composed of 67 items assessing the *learning style*, *personal traits* and *abilities* of subjects. While, the second one, Career Choices scale, is composed of 40 items related to *occupational interests* (Fig. 1).

¹ Centro di Ateneo per l'Orientamento e il Tutorato; www.orientamento.unisa.it.

² Progetto SCHOLA, Programma Operativo Nazionale "Ricerca Scientifica, Sviluppo Tecnologico, Alta Formazione" 2000-2006, Asse III - Misura III.5 Azione Orientamento.

In particular, the former 67 items are related to eight latent concepts, summarised as follows:

- *problem solving* subscale (6 items): capacity to solve problems and to give answers in difficult situations;
- *method of study* subscale (12 items): concentration and attention in the learning methods;
- *academic motivation* subscale (12 items): academic motivation at school;
- *personal traits* subscale (16 items), with four personality characteristics: *emotional balance*, that is the capacity to manage the emotions and the behaviour also in difficult situations; *sociability*, that is the opening and the availability towards the others, the interest in the interpersonal relations and the capacity to collaborate; *self-esteem*, that is the tendency to being satisfied with themselves, to feel good in various situations; *flexibility*, that is the ability to change, grow, as life's circumstances change;
- *abilities* subscale (21 items), that measure the verbal, spatial and math skills whit some logical test.

The latter 40 items, concerning the *occupational interests* (IP), are divided in 5 areas that identify five academic fields: Humanities Studies, Economics and Law Studies; Sciences, Mathematics, Engineering and Technological Studies; Pharmacy and Medicine Studies. For each academic field eights items have been included to evaluate the different occupational interests.

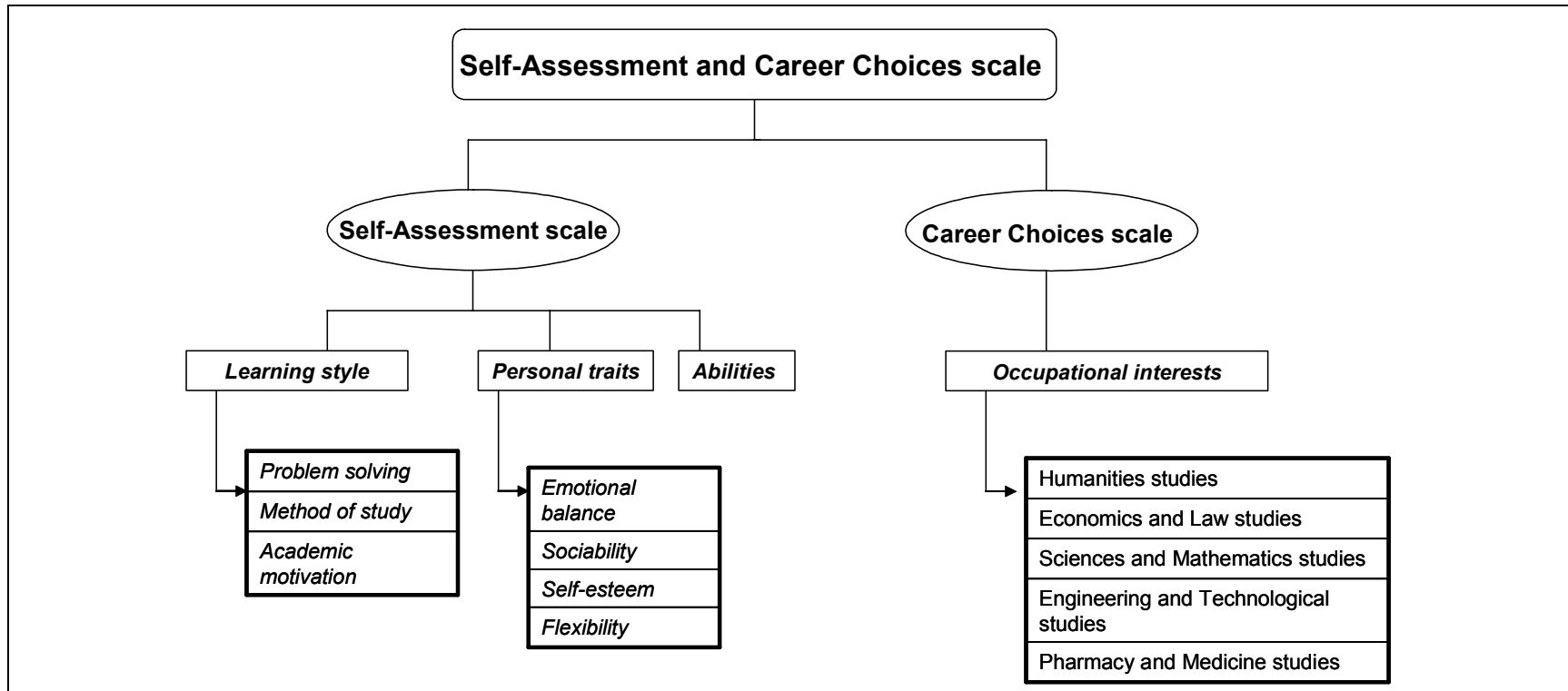


Fig. 1 - The Structure of Self-Assessment and Career Choices scale

3. Exploratory Analysis for the Self-Assessment and Career Choices Data

The analysed data were collected during the period October 2003–September 2004 for a total of 5280 contacts to the University web site.

The students who have taken the on-line orientation questionnaire are mainly women (60.4%), who come from maths or technical programs in high school (39.5% and 20.9% respectively). 20% of their parents have a high school diploma or bachelors' degree and 16.2% of the respondents had not decided yet if, after the high school, to enroll in an undergraduate program or to enter the job market.

With respect to the questionnaire's items of the Self-Assessment scale, the subjects have provided positive answers for such statements related to the capacity to solve problems, the academic motivation and the learning style. As an example in Fig. 2, we report the bar charts of two psychological indicators, that show a concentration of the answers on high ratings in the Likert scale format. While, the 40-occupational interests items are characterized by answers which highlight a great interest of the subjects for the humanities programs.

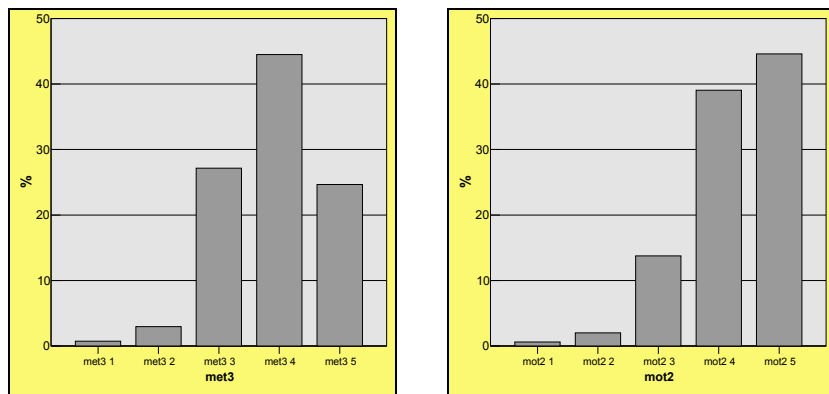


Fig. 2 - Bar charts of two indicators in method of study and academic motivation subscales

A reliability analysis was conducted through the Cronbach's index to provide information about the relationships between the items and the internal consistency of the proposed scale³. The Self-Assessment and Career Choices scale provided a significant Cronbach's index of 0.88 for the first groups of items describing personal factors, skills, abilities and learning experiences of subjects and 0.90 for the 40-items of the occupational interests. However, this coefficient is only a measure of the level of average intercorrelation for standardized data.

The data matrix of I rows and J columns, generated by the on-line database, has been further analysed through multivariate techniques in order to evaluate the performance of the proposed scale and the one-dimensionality⁴ of chosen items in the different sections of the scale. In particular, a correspondence analysis has been performed on the 46 items⁵ of Self-Assessment scale to describe the structure of the main factors which underline the different sets of items in the scale, and to observe the structure of the relationships among the observed indicators. Furthermore, a principal component analysis and a cluster analysis have been performed to verify the structure of the occupational interests in the given population of respondents. In fact, as it is well known, the principal components analysis shows the underlying structure of a relatively large set of variables determining the factors which account for the large amount of the variance (Lebart *et al.*, 1995). The cluster analysis, instead, partitions the entire data set of n subjects into a specified number of disjoint groups, so as to optimize a stated mathematical criterion (Gordon, 1981). The results of the data analysis are summarised in the following.

The graphical representation of the results of the correspondence analysis, shows the one-dimensionality of the different concepts measured. Guttman effects have been observed in the factorial plan, (Greenacre, 1984; Rijckevorsel, 1986) and it is

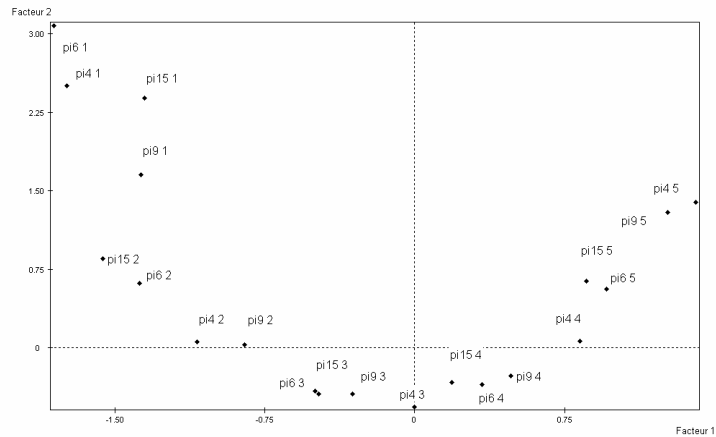
³ The value accepted for this coefficient is 0.70 or higher for a set of items to be considered a scale, (Spector, 1992).

⁴ A set of observable categories are intended and expected to work together along a single, useful underlying dimension, (Greenacre, 1984).

⁵ In the data analysis we refer to only 46 items on the total 67 items because we don't take into account the 21 items of the verbal, spatial and math abilities subscale.

clearly visible in the first principal axis for each latent construct under study. As an example, we report the horseshoe pattern of the *emotional balance* and of the *self-esteem* related to the *personal traits* subscale, as shown in the Fig. 3a and Fig. 3b.

(a) *Emotional balance*



(b) *Self-Esteem*

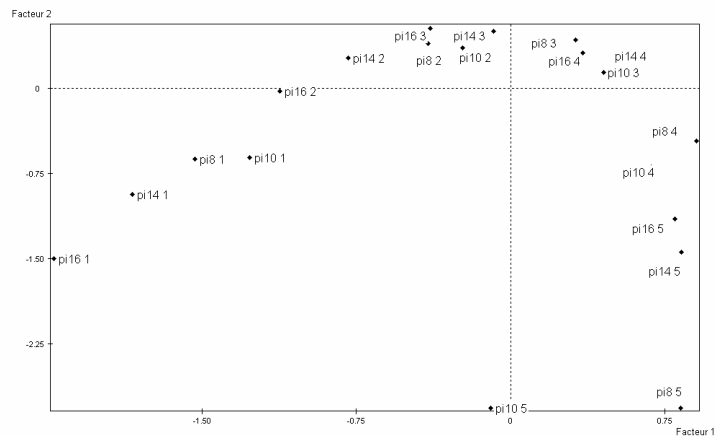


Fig. 3 - Factorial plane showing Guttman effect of personal traits

The 40 items of the Career Choices scale, related to occupational interests, have been analysed through a principal component analysis in order to determine whether the selected items, have an underlying structure. As shown in Figure 4, the factorial plane, determined by the second and third factor, allows to visualize four groups of variables that correspond to four academic fields: Economics and Law studies; Pharmacy and Medicine studies; Humanities Studies; Sciences, Mathematics and Engineering studies. In particular, in this graphical representation there is no evidence of any difference among the Sciences, Mathematics and Engineering studies. The application of the scree test method to the eigenvalues plot (Fig. 5), has suggested a four components solution that accounted for 50% of the variance⁶.

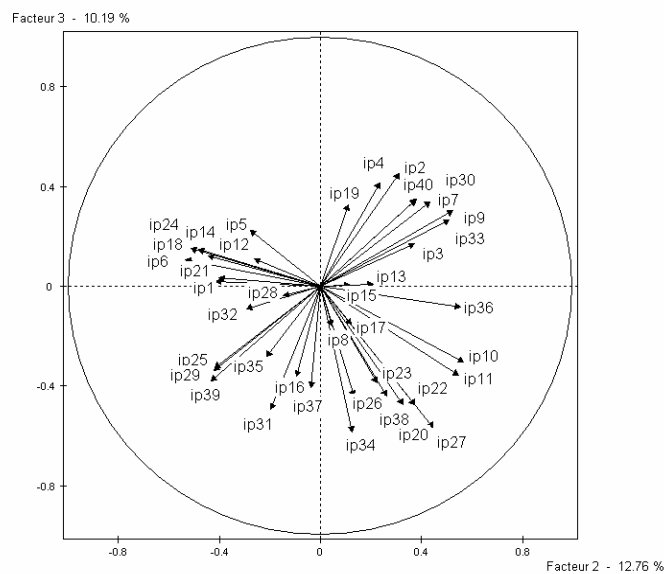


Fig. 4 - Second and third factor of 40-occupational interests items

⁶ As a method for determining the final number of factors that we need to explain the phenomenon under study, we have referred to the scree test method (Cattell, 1966).

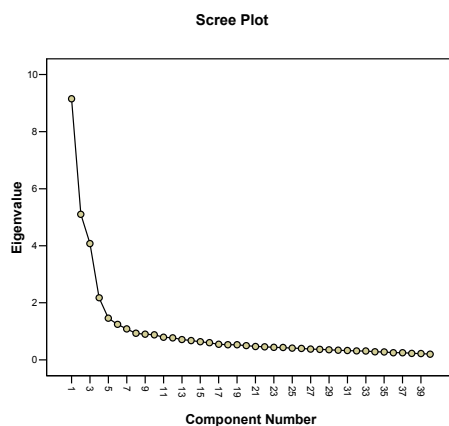


Fig. 5 - Scree plot of eigenvalues of 40- occupational interests items

Following the results of the principal component analysis, a cluster analysis was performed to verify the capability of the proposed items to identify the different academic fields. In a first step, a hierarchical cluster analysis has been conducted through Ward's linkage method. The corresponding dendrogram (Fig. 6) has been divided in a partition of seven different clusters. Five groups are defined by an interest in one academic program, two groups are characterized by subjects who are unable to make a decision about the choice of a specific academic fields, also if in some case they show good academic motivation and involvement in the study.

The exploratory data analysis, performed in each subscale of the Self-Assessment and Career Choices scale, has showed the one-dimensionality of some factors and the presence of underlying concepts measured by observed indicators.

The analysis of the relationships among the phenomena under study is also of great interest. Therefore, we have investigated the relationship between the learning style and personal traits and the relationship between the career choices process and the personality traits of the "potential" undergraduate students.

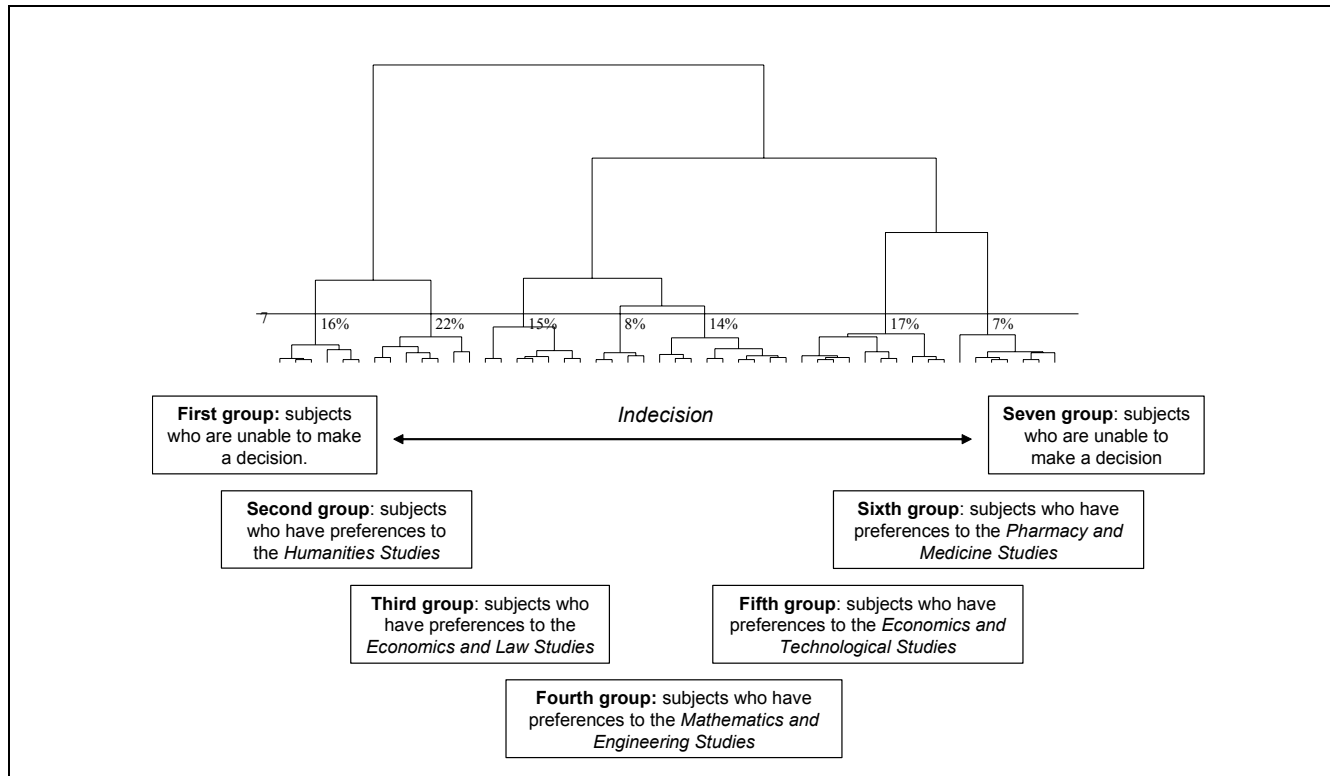


Fig. 6 - Dendrogram from Ward Method's and groups of subjects

4. Empirical evidence on the investigated phenomena

In this section, the results of a correspondence analysis for ordinal data are reported. This has been performed in order to investigate the relationship between the three latent factors of the learning style subscale, *problem solving*, *method of study* and *academic motivation*, and the four latent factors of the *personal traits* subscale, *emotional balance*, *sociability*, *self-esteem* and *flexibility*.

A crucial point in the subject's career choices process was the analysis of the factors that might influence the choice of a specific academic program. A simple way to describe the relationships between the occupational interests and the personal traits was to define a categorical variable related to the seven different groups obtained by the cluster analysis on the 40-items of the Career Choices scale. This categorical variable is related to learning style, academic motivation and socio-demographic characteristics of the subjects who took the on-line orientation questionnaire. The main results obtained are discussed in the following sections.

4.1 Learning style and Personal traits: some considerations

In order to evaluate the relationship between the latent factors of the *learning style* and *personal traits* subscales, a doubling technique was carried out on the ratings of the self-assessment variables (Greenacre, 1984). The analysis is applied to the doubled data matrix comprising the original data and their reflected form⁷. By means of this analysis, it is possible to obtain many information about the average rating, the spread in the data and the correlation between the phenomena investigated.

The graphical representation of the factorial plane shows the doubled columns where pairs of points for each variable

⁷ In our case, the reflected form is obtained by subtracting each of the ratings from 5 in order to take into account the bipolar nature of the ratings. The doubled data matrix has been converted the 5 point scale in a theoretical scale with endpoints 0 and 4.

represents the poles of rating scale, with a positive pole (P) and a negative pole (N). The lines, that joined the endpoints of two variables, show the different spread of phenomena under study. The relationships are, instead, examined observing the angle formed by the lines among each couples of variables. The closeness of all the positive poles to the origin of the map, shows the high average ratings of the items. Moreover, when most of the subjects choose the endpoints of the scale, there is an high polarization of the rating scale.

In our case, as shown below in Fig. 7 and Fig. 8, in the 2-dimensional representation of correspondence analysis, the first axis reflects that some subjects give consistently higher score. In particular, in Figure 7 we can see that many students have a good learning style and a high academic motivation, while few students have a negative self-appraisal for learning style, analytical skills and academic goals. The observed indicators of academic motivation present more spread respect to those of problem solving and method of study. It is also possible to observe the closeness between all the variables which measure the academic motivation, the variables which consider the concentration at school and those that describe the negative aspects of school (stress, moral obligation, uneasiness).

In Fig. 8, instead, a greater spread has been registered in the answers of items related to the personality traits. In fact, most of people have selected a middle score in the Likert format scale. A relationship has been observed between the variables which measure the opening to the others and the interest in the interpersonal relationships, as well as between the variables that assess the capacity to manage the emotions and the behaviour in difficult situations.

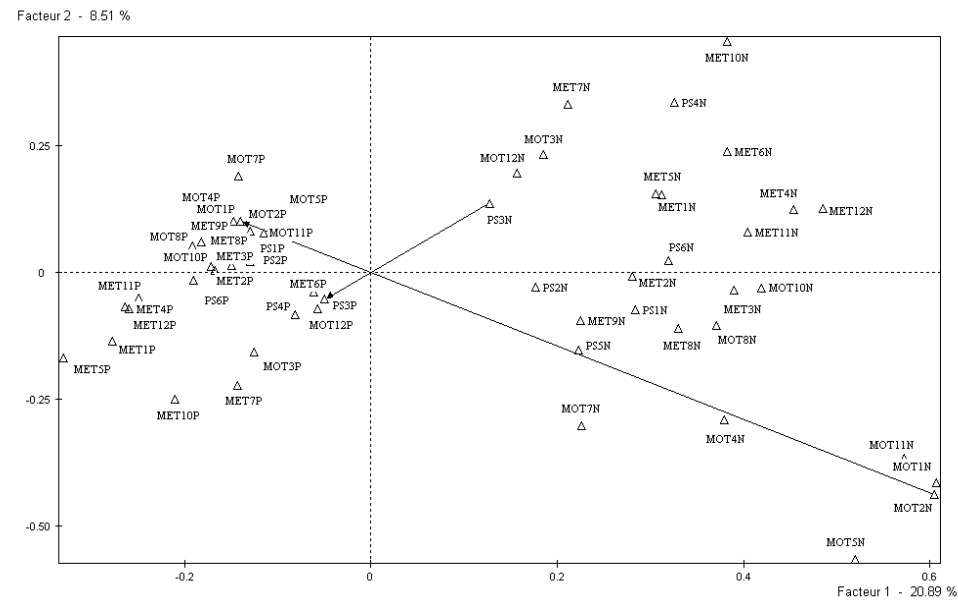


Fig. 7 - 2-dimensional correspondence analysis of doubled learning style data⁸

⁸ In the map, for each indicator investigated in the *problem solving*, *method of study* and *academic motivation subscales*, there are two variables: a positive pole (MetP, MotP, PSP) and a negative pole (MetN, MotN, PSN).

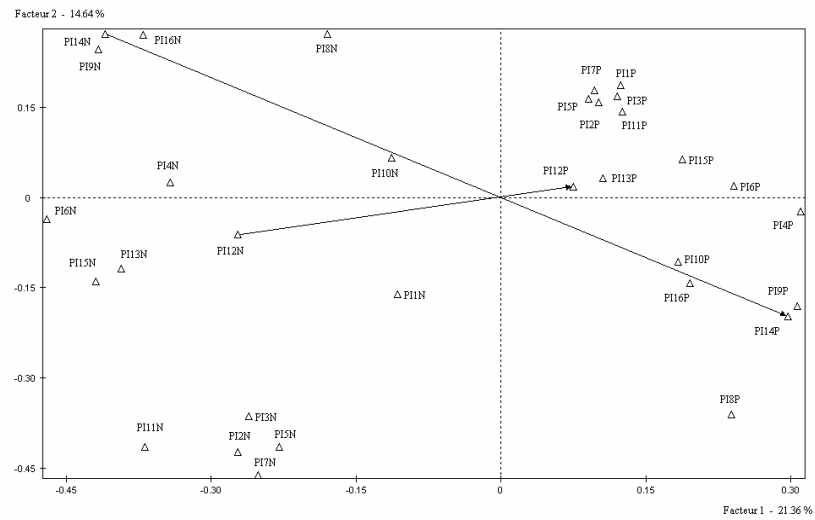


Fig. 8 - 2-dimensional correspondence analysis of doubled personal traits data⁹

⁹ In the map, for each indicator of the *personal traits* subscale there are two variables: a positive pole (PIP) and a negative pole (PIN).

4.2 Personal traits and career choices process of the potential undergraduate students

Following the results of the cluster analysis performed on the 40-occupational interests items, we defined a categorical variable with seven categories that reflects the seven groups in order to identify the specific program chosen by “potential” undergraduate students. The relationship between the above mentioned categorical variable, on one hand, and the self-assessment variables described in the Self-Assessment scale and socio-demographic characteristics, on the other hand, has been investigated. In fact, when we try to measure the process of choosing a specific academic field, there are several aspects to consider, for example the tendency to being satisfied with himself, the opening and the availability towards the others, *etc.*

A simple descriptive analysis, has showed that the Economics, Law, Mathematics and Engineering degree programs are chosen by male students that come from technical and engineering or maths high schools with high personal involvement in the study and good capacity to problem solving. The Humanities Studies are preferred by female students with high academic motivation but low self-esteem, while the Pharmacy and Medicine Studies are selected by students that take a maths course in the high school with high analytical capacity and good learning style.

Moreover, there are two groups in which the subjects are mainly characterized by their inability to make a decision about the choice of a degree program. In particular, the first group is essentially composed by females with a poor academic and social motivation; while the second group includes males involved in the study but without interest in a specific academic field (Fig. 9).

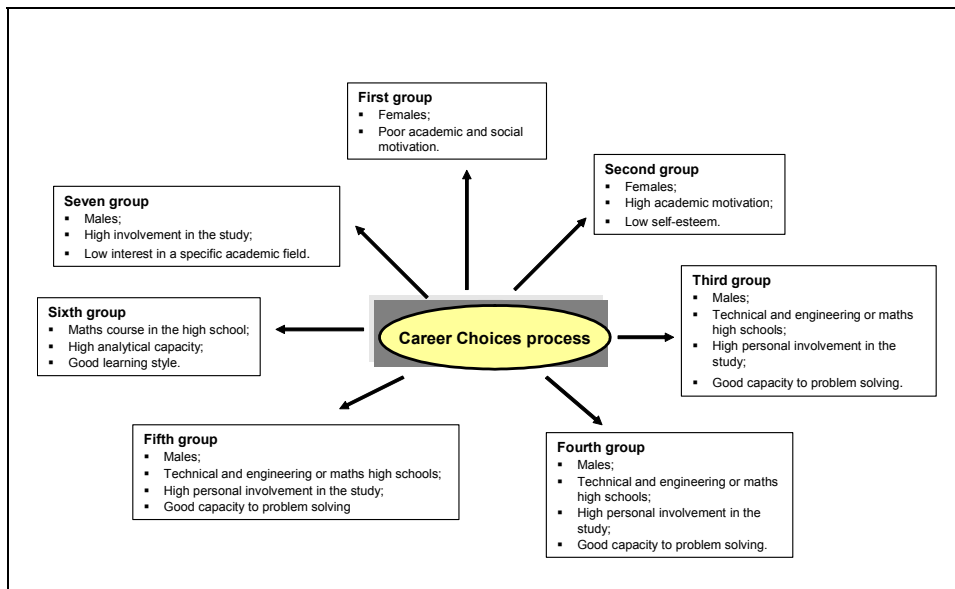


Fig. 9 - The Career choices process and the characteristics of groups of subjects

5. Concluding remarks

The results of the present study provide good support for understanding the phenomena under analysis and have a relevant practical implication in order to improve the structure of the proposed Self-Assessment and Career Choices scale.

Although the 5280 subjects who filled in the questionnaire were not a representative random sample of the population of high school students, the exploratory data analysis showed the validity of the chosen indicators to measure the underlying concepts and investigated the main factors that influences the career choices process. As further research, it would be possible to select a cohort of

high school students in order to generate representative random samples. In this case a longitudinal study should be performed to analyse the passage through the educational system (school-university) and, in particular, to describe the factors that are related to the decision making process of “potential” undergraduate students.

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