THE LEARNING STYLE OF TEENAGERS WITH CALLOUS-UNEMOTIONAL TRAITS

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Abstract. *Students with callous-unemotional (CU) traits, characterised by callousness/meanness, uncaring and unemotional features, manifest both cognitive and behavioural dysfunctions that can increase the effect of the CU risk factor itself. As a matter of fact, such problems include learning difficulties, lower academic achievement and school dropout. The aim of this paper is to investigate the common pattern of learning styles exhibited by students with CU traits and to propose a discussion about the use of this preference. The study has been conducted on a sample of 689 high school students, 14 to 19 years old, using the Tandem analysis. The investigation highlights a specific learning style pattern for students with CU traits: verbal visual, analytic and individual. The findings will have surely important pedagogical impacts, shifting the problem to how their school results could be improved by encouraging their inclusion.*

Keywords: *learning style, callous-unemotional traits, tandem clustering, behavioural and cognitive dysfunctions, student behaviour*

1. INTRODUCTION

Callous-unemotional (CU) traits have been widely studied in young and very young populations. These are considered precursors of the adult psychopathy personality disorder and are sub-divided in callousness, uncaring and unemotional features (Frick and Ellis, 1999; Frick et al., 2014).

Experts consider these personality aspects related to serious externalizing behaviours and to higher likelihood to develop a criminal career. Moreover, young people with callous-unemotional traits are more prone to suffer a troubled and dysfunctional life (Virtanen et al., 2020). These are the reasons responsible for the increasing number of studies and researches on the topic. Psychologists and psychiatrists focused on several characteristics: risk factors, gender influences, moral development, emotional functioning, behavioural outcomes, levels of aggression (Carvalho et al., 2018). Less can be found from a pedagogical perspective. However, educational studies could largely contribute to the understanding of these traits, managing prevention too. In fact, young people spend most of their time in schools, relating to teachers and other education professionals. In school, students learn not only different subjects, but also how to build relationships, to cooperate with others, to respect authority, to be praised or blamed for their behaviours, to develop morality and critical thinking. Most of these aspects are affected by callous-unemotional traits. Academic results have been related to CU traits too: they result lower in students with high levels of them (Ciucci and Baroncelli,

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2013). Moreover, it is estimated that an important sub-group of aggressive students, guilty for the most serious acts of bullying, presents CU traits (Viding et al., 2009).

Most of research is focused on understanding the emotional and moral development of these students, with very specific studies about learning from a neuropsychological perspective. The aim of this work, instead, is to investigate the possibility that students with CU traits show frequent pattern in their learning styles. Hence, we focused on the didactic aspects in Italy, where the prevalent teaching method is still the frontal didacts (Pagani and Morini, 2020).

The rest of the paper is organised in the following way. In the second section, we list the characteristics of students with CU traits and we explain the aim of this research: the association study between CU traits and learning patterns. In the third section, we introduce the statistical methodology applied to data collected by administering the questionnaires described in the fourth Section. Then, we discuss the main results in the fourth section. Finally, the fifth section provides the discussion and conclusions of our study.

2. THE CU TRAITS AND LEARNING STYLE

CU traits are a relatively new field of study that derives from the professionals' interest in understanding the development of the adult psychopathy disorder. As already mentioned, the currently used definition and assessments specify three different traits: callousness, uncaring and unemotional (Cardinale et al., 2020). "Callousness" refers to features as lack of empathy and guilt; "uncaring" includes variables such as lack of care for the feelings of other people; "unemotional" describes deficiencies in emotional affect (Ciucci and Baroncelli, 2013). Of course, there is the documented possibility to deal with comorbidities and to find students with other conduct problems and CU traits. However, in general, when CU traits are prevalent the student shows specific characteristics:

- He/She manifests aggressive behaviours. These behaviours can be instrumental or impulsive. However, CU traits have been more related to an instrumental aggression, which means that it is premeditated, cold, manipulative. This means that their aggression can be manifested through the meanest bullying acts, from inciting others to act against classmates to beat them in the hardest ways (Urben et al., 2018; Thornton et al., 2013).
- He/She is almost totally disinterested in classroom activities. He/She shows an air of sufficiency, finding everything boring.
- He/She seems indifferent to punishment and blame. There is no reprimand that can penetrate his/her coldness or adjust his/her inopportune behaviour. The same can be seen for rewards: good marks or praises have very short effect and seem to not give enough satisfaction (Yonglin et a., 2019).
- He/She finds very difficult to work in group. He/She is not comfortable with other and others are not comfortable with him/her. Classmates could be scared by him/her.
- He/She is smart, but his/her marks are lower than those of others. This behaviour could be summarised by the sentence "he/she is full of potential, but he/she does not apply him/herself" (Fanti et al., 2016).
- He/She seems insensitive to others' needs, emotions and feelings. There is more difficulty in recognizing sadness and fear reactions (Moore et al., 2019).
- There is no sign of remorse and guilt even after a serious bad behaviour (Fanti et al., 2018).
- There could be signs of difficulties even in recognizing his/her proper emotions.
- This is a description of all the traits in their extreme form and it is important to highlight that it has not a diagnostic purpose. The aim of this list is to indicate some of the behaviours and tendencies that

teachers could observe in their classrooms and helping them recognizing these features. In fact, for this subgroup of students, literature suggests specific educational paths (e.g. Houghton et al., 2017). It is crucial - both for teachers-classrooms well-being and a good prevention. After this short description, it is not surprising that these traits are correlated to the most serious criminal acts.

This work is part of a wider project[2] that was aimed to:

1. assess the presence of CU traits in the Italian young population;
2. understand if the presence of the traits is affected by geographical location, socioeconomic status, family situation and the use of drugs (Zanetti and Rossi, 2020);
3. investigate the possibility that students with CU traits have specific learning patterns, referring to the didactic aspect.

This paper focuses on the latter. We administered to a sample of 689 Italian students three questionnaires: The Inventory Callous-Unemotional (ICU), the Skills and Difficulties Questionnaire (SDQ) and the Learning Style Questionnaire, an Italian version of the famous Kolb questionnaire elaborated by Luciano Mariani (2010). This questionnaire has been widely used in Italy and has brought reliable results. The SDQ has been administered as a reinforcing validation of the ICU since it detects externalizing and internalizing behaviours that could be associated to the presence of conduct disorders and CU traits. The results of this first part confirmed the presence of CU traits and their correlation with externalizing behaviours (Rossi, 2020). It was then observed the irrelevance of the geographical location and the socioeconomic status while the traits resulted affected by family situation and the use of drugs.

Learning styles identify a pattern of preferred approach to learning of a person, his typical and stable way of perceiving, processing, storing and retrieving information (Mariani, 2000). A learning style depends on the preferred/more stable sensory channel of a person. The literature recognizes four sensory channels through which information can be perceived, which characterize the access to information, the prevailing learning style of the person and, therefore, the methods of study that are most effective (Sener and Çokçaliskan, 2018):

- Visual-Verbal Learning Channel and Style: it represents the preference for reading and writing.
- Visual-Non-Verbal Learning Channel and Style: it is characterized by a preference for images, drawings, photographs, symbols, graphics, diagrams and concept maps.
- Auditory Learning Channel and Style: it implies a preference for listening, therefore by attending a lesson or debate and working with a partner or in the group.
- Kinesthetic Learning Channel and Style: it is the preference for concrete activities to understand the subject.
- In addition to this sensory pattern, the Learning Style Questionnaire (Mariani, 2000) evaluates other two areas: the preference for an analytic or global style and for an individual or group study. An analytic style refers to a mode of elaborating information based on logic and systemic reasoning, focused on facts and details. The global way to process information, instead, tend to consider situations concisely, based on intuition and general aspects of a problem. Finally, the last area identifies the preference for individual or group study (Falcinelli et al., 2016).

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[2] This work is based on the doctoral thesis of author Margot Zanetti.

3. METHODOLOGY: TANDEM CLUSTERING

For the multivariate analysis of this survey data, among the most widely techniques proposed in literature (such as multiple factor analysis for mixed data by Pagés, 2004, and non-linear principal component analysis by Gifi, 1990) we consider *Tandem Clustering* (Cho et al., 2006; van de Velden, Iodice D'Enza and Palumbo, 2017) that can be seen as way of reducing redundancies in the data. Here, tandem clustering uses a dimension-reduction technique, such as multiple correspondence analysis (Benzécri, 1973; 1979; Lebart et al., 1984; Greenacre, 1984; Gifi, 1990), to create new variables, which have the advantage of being uncorrelated, and then considers cluster analysis to form classes using such new variables.

Multiple correspondence analysis (MCA) allows the construction of a series of latent variables (or factors), linear combination of the original variables, which express concepts that are not directly observable in reality, while measuring the association of a set of categorical variables.

Starting from the MCA factors instead of using the original variables, the statistical units (here students) will be grouped by using a Hierarchical agglomerative clustering algorithm (Rousseeuw, 1987). As a result, only the most important variables will lead to the identification of similar groups of students. Indeed, the factors, being orthonormal, have the advantage of providing the same impact on the (dis)similarity index used to measure the distance between the groups of students. The results of this integrated analysis approach allow us to better specify the profiles of students and find confirmation of the students' characteristics already identified in multiple correspondence analysis. Among the different algorithms and software for performing Tandem Clustering (Cho et al., 2006; Husson and Pagés, 2010, van de Velden, Iodice D'Enza and Palumbo, 2017), we consider a free open-source package, called "FactoMiner", written in R programming environment, for its richness of output information.

3.1 Multiple Correspondence Analysis

Multiple Correspondence Analysis aims to analyse the association existing between a set of categorical variables observed on a collective of statistical individuals/units. Through the creation of new variables (latent variables) and the identification of an optimal space of reduced dimension, MCA is a powerful statistical tool that is used to assign scores to units and to each variable categories.

Analysing survey data by using MCA can be made calculating a super-indicator matrix $\mathbf{X} = \begin{bmatrix} \mathbf{X}_1 | \ldots | \mathbf{X}_k | \ldots | \mathbf{X}_p \end{bmatrix}$ of p ordered categorical variables observed on the same set of n individuals. Le $\mathbf{D}$ be the super-diagonal table of dimension $J \times J$ where the (k, k)th diagonal matrix contains the relative column marginal frequencies, $p_{\cdot j_k} = \sum_{i=1}^{n} \frac{x_{ij_k}}{n}$, for the kth variable.

Observe that an indicator matrix implies coding the data in a complete disjunctive form (Lebart, Morineau and Piron, 1997; Greenacre, 1984). For example, the matrix $\mathbf{X}_k$ consists of elements 0 and 1, where 1 represents that an individual/unit is classified into a category and a 0 indicates that it does not share that characteristic. Therefore, the total number of categories under consideration is $J = \sum_{k=1}^{p} j_k$, where the generic variable k has j_k categories.

There are many ways with which multiple correspondence analysis can be presented, one of those is to perform a (generalized) singular value decomposition of the super-indicator matrix

$$\frac{1}{p\sqrt{n}}\mathbf{X}\mathbf{D}^{-\frac{1}{2}} = \mathbf{U}\mathbf{\Lambda}\mathbf{V}^{T}$$

where $\mathbf{\Lambda}$ is the diagonal matrix of the singular values, $\mathbf{U}$ and $\mathbf{V}$ are the right and left singular vector matrix, respectively, which allow the computation of the coordinates for units and variable categories. The coordinates of the categories allow to display also graphically the relationships existing among the variables. In particular, since each category is the centre of gravity of the units (students) that have chosen it, the proximity between two categories highlights those chosen by the same students or by very similar students: the proximity between two categories can therefore be interpreted in terms of association between them. Similarly, the proximity between two units allows to highlight the similarity/dissimilarity among students.

3.2 Hierarchical Agglomerative Clustering

For identifying homogeneous groups of students rather than describing single students, we perform a cluster analysis (Husson and Pagés, 2010) on the unit coordinates obtained through MCA which contain a synthesis of all original variable information.

In the literature (Husson and Pagés, 2010), the term cluster analysis indicates a set of statistical techniques used to group statistical units based on the similarity of their profile, described by a set of variables. The resulting units/students' groups should be characterized by a high degree of internal homogeneity and there should be a high degree of variability between the students' groups. Not knowing a priori the suitable number of students' groups to analyse, among the plethora of classification methods, we preferred to consider the hierarchical agglomerative clustering, whose logic can be summarized through the following steps.

- In the initial stage, each student forms a separate cluster.
- In the second step those two students, which have minimum distance, are merged. For the calculation of the distance, the Ward method has been used; it is based on the decomposition of the total deviance into deviance between groups and deviance within groups. At each step, then, those two groups that get the minimum within-group deviance are merged.
- The third step calculates the distance between the new cluster (group) and all the other units.
- Finally, steps two and three are repeated until a configuration is reached where there is only one group. The clustering process can be graphically represented through a dendrogram (see Figure 1), from which it is also possible to read the aggregation index and appreciate how much a group is separated from the others. Of course, the aggregation index can be used in order to identify the suitable number of clusters: cutting the cluster tree after the fusions that correspond to low values of the aggregation index and before those corresponding to high values of the aggregation index (Ghergi and Lauro, 2010).

4. DATA ANALYSIS

We administered ICU, SDQ and Learning Style Questionnaire in two high schools, one in Verona, north-east of Italy, and one in Rome. The students, 14 to 19 years of age, filled the questionnaires through their smartphones, supervised by teachers and researchers, in the period between November 2019 and January 2020. We obtained 689 reliable answers. The sample was diverse in regard to parental educational level but representative of families in the school districts.

The Inventory Callous-Unemotional is now a widely used instruments, that we used in the self-report version. ICU is a copyright-protected 24-item questionnaire, each of which is rated on a four-point scale (0 = not true to 3 = very true), aimed to provide a complete assessment of callous and unemotional traits. The ICU presents three subscales: Callousness, Uncaring, and Unemotional. It has been developed to be self-administered or to be filled by persons close to the young people under evaluation (e.g. teachers, parents). In this work, we use the Youth Self- Report (Ciucci, et al., 2013).

The Learning Style Questionnaire used is a 40 items questionnaire, rated on a four-point scale (0 = not true to 3 = very true). Different items assess the three different areas investigated (A: visive verbal, visive non-verbal, kinaesthetic, auditive; B: analytical, global; C: group, individual). The learning style of the student is composed by all the areas.

In this paper, we analyze the association between the CU treats and each of the three areas concerning the learning styles.

After extrapolating the answers to the ICU questionnaire (appendix 1) for investigating the presence of the CU trait in adolescents/students, first we carry out the MCA on our data. Successively, we perform a hierarchical analysis to identify homogeneous groups of students.

All statistical analyses (MCA, hierarchical cluster and distance-based statistics) have been carried out using the free open-source packages "FactoMiner" and "fcp" available at https://cran.r-project.org/web/packages/FactoMineR/index.html and https://search.r-project.org/CRAN/refmans/fpc/html/cluster.stats.html, respectively.

For sake of simplicity, the clusters' specific indexes, provided by the packages, are available (upon request to the authors) as supplementary material alongside the code and data.

Figure 1 shows the dendrogram or classification tree, i.e. the automatic arrangement of the clusters and suggests to consider three clusters of homogeneous individuals. The first cluster consists of 273 individuals, the
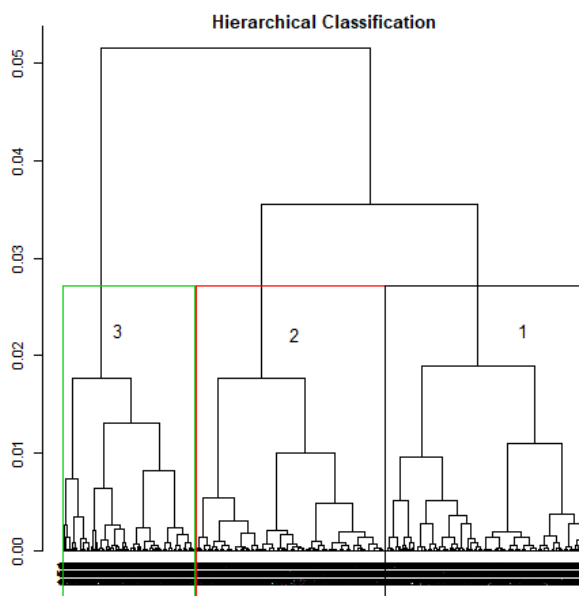
second of 262 individuals and the third of 153 individuals. The goodness of clustering using three groups has been assessed by computing several distance-based statistics, among which, average distances within and

between clusters, cluster separation, average silhouette widths, the Calinski and Harabasz index, the Dunn index (Calinski and Harabasz, 1974; Rousseeuw, 1987).

Figure 1. The dendrogram

Figure 2 and the clusters' specific indexes, provided by the packages, show the variables that characterize and justify the creation of those three clusters. Individuals in clusters 1 and 2 show low or zero values of the CU variables, respectively. Concerning the learning style in these two clusters, we do not highlight any combination of the three learning areas, or better Italian students do not show a clear preference of learning style.

The cluster 3 is made up of individuals with prevalence of callousness, characterized by an absence of empathy, a contempt for the feelings of others and superficial or deficient affections, such as an absence of remorse or guilt. Individuals of this cluster show homogeneity in the learning mode, highlighting a particular combination of all three sensory modalities:

- Visual verbal for area A. These students prefer information that is presented visually and not in a written format feeling most comfortable reading. They probably learn better when having the opportunity to read about a concept rather than listening to a teacher explain it.
- Analytic for area B. These students learn by discerning through their experiences, dwelling a lot on the details. They prefer to get to the solution of a problem by a well-defined and mathematical calculation process.
- Individual for are C. These students prefer to work alone and conduct an individual study. They learn better by reading a book at home, rather than working with others.
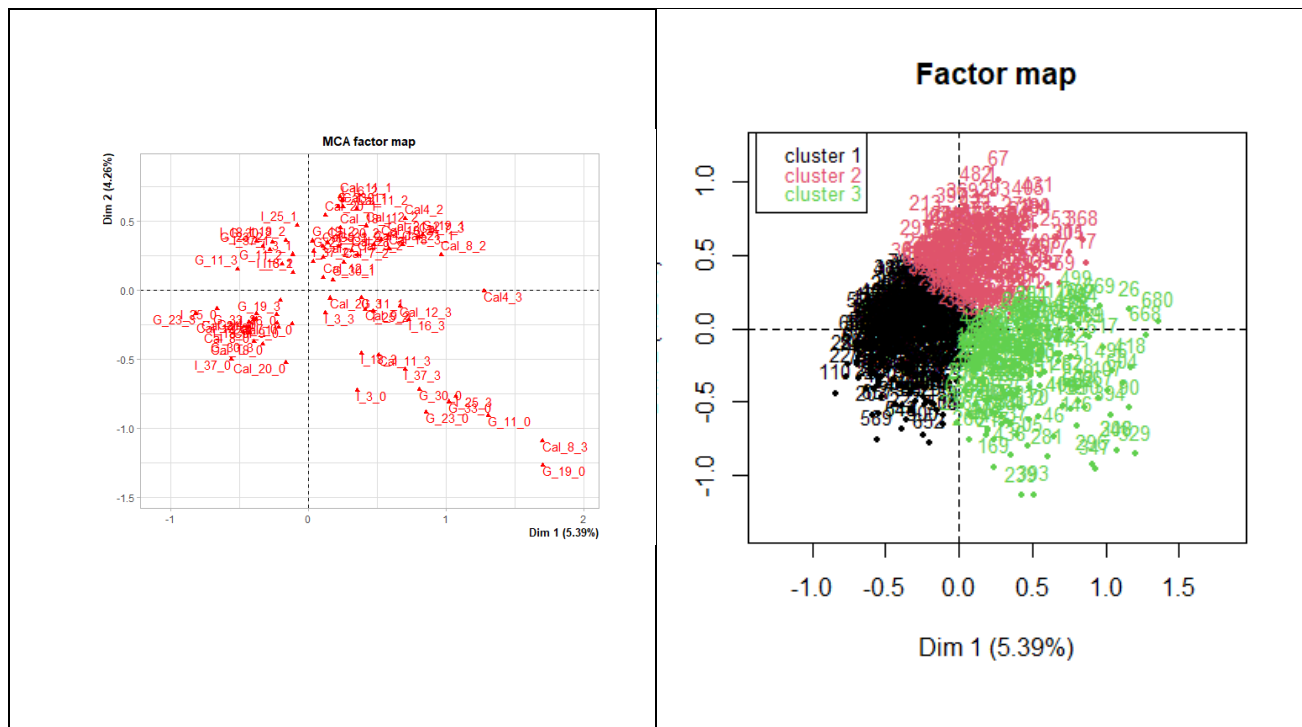
Figure 2. The MCA factor maps. On the left side, the plot of variables categories. On the right side, the plot of students labeled according to the three clusters' colors.

5. DISCUSSION AND CONCLUSIONS

It must be cleared that a learning preference does not lead necessarily to an improved performance. There is many studies in fact, that put into discussion the learning style approach, supporting new methodologies (Kirschner, 2017). However, the specific learning style pattern students that emerged in our study (verbal visual, analytic, individual) is coherent with some previous findings. If the B area (global/analytic) and the C area (group study/individual) could be predictable, more doubts could arise for the A area. A large number of studies, in fact, evidenced that the emotional dysfunctions related to psychopathy seem linked to poor fear recognition, deficits in reversal-learning and diminished conditioned-fear response (Cardinale et al., 2020). From these findings we could hypothesize that these learning deficits could be associated with the lower academic results, hence, the didactic learning.

An important facet of learning is emotion. If emotional functioning is biased, it is possible to suppose that learning styles based on it, are less adequate. Hence, styles based on spoken voice can result less effective with students with Callous traits, since they have difficulties in detecting and processing some emotions (Dawel et al., 2012). Moreover, the deficits with reversal learning and in learning from experience could let us hypothesize that also the kinaesthetic pattern could have less impact on CU students (Takeyuki et al., 2019). Of course, this idea presumes a partial overlap between neuropsychological and didactic tasks, that can be put into discussion. Thus, the learning through reading and then elaborating notes or schemas seem to be the most logical result for students with CU traits: there is less the need to understand and process external (emotional) stimuli and it is always possible to see all the information wanted.

However, to explain lower academic results of CU students, it is necessary to further explore other two important factors: intelligence quotient (IQ) and executive functions. First, it is important to report that CU emotional dysfunctions do not seem to affect IQ, above all when we are dealing with psychopaths of the first type (Bird et al., 2019; Watts et al., 2016). The studies show controversial results, so it is not possible to presume that CU students present neither a lower nor a higher IQ. A question arises immediately: how it possible that student with normal or higher IQ and with a learning style largely present in school achieve lower academic result? The next step of the investigation is to consider executive functions. It is widely known that conduct disorders, Attention-deficit/hyperactivity disorder (ADHD) and forms of autism, seem related to executive deficits. Callous-unemotional traits can be associated to some variables of these disorders (Fanti, Kyranides, 2018). Executive functions are in the orbitofrontal cortex (emotion regulation and decisional processes), in the dorsolateral prefrontal area (abstraction, planification) and in the anterior cingulate cortex (interfering stimuli, motivation control). In psychopaths, all these areas seem to work differently. Due to such findings, we can hypothesize that students with CU traits show lower academic results for an impairment in one or more of executive function. Nonetheless, the studies are, again, controversial. Young people with high CU traits show better executive function than other group in different studies (Graziano et al., 2019). On the other hand, working memory impairments and other deficits were found in other researches (De Brito et al., 2013).

Another possibility including executive functions is that CU traits affect motivational processes, partially located in one of the cerebral areas that work differently in psychopaths. It is a matter of fact that students with CU traits - and adult psychopaths - show a different sensibility in the reward-punishment mechanism (Godman and Jefferson, 2014). They seem more insensitive to punishment and reprimands and it is coherent with the difficulties found by neuropsychologists when assessing the feedback-processing capacity. This could mean that students result less motivated since the normal scholastic evaluation system rewards and blames through written marks, but also through teachers' attitudes. These attitudes, together with those of parents, are normally perceived by students and influence their will to achieve good results (Bariroh, 2018). But if an individual

cannot process correctly anger, fear and sadness reactions, could not be able to understand the severity of a situation. Hence, he/she could not be motivated to elicit different reactions in the adults surrounding him/her. Negative marks and negative adult attitudes are not understood and felt as important. This interpretation would fit with a significative learning perspective, in which for a good learning motivational processes are fundamental (Ausubel, 1978).

Other variables to consider are those that we considered when assessing CU traits and problematic behaviours: family disaggregation and drug use. The CU traits resulted higher and more related to externalizing behaviours in presence of these two factors. Family problems usually interfere with students' performance (Nusinovici et al., 2018; Clark and Frick, 2018). In this case there could be the possibility that these problems contribute to a lack of attention, from parents, on children school conduct and performance. Hence, there would be mitigated negative feedback, not felt as important. It is fundamental, from our perspective, to also consider families. Learning and a healthy growth depend on multiple factors and the significative adults of a teenager cannot be excluded. The use of drugs implies that there has already been an entrance to a deviant path. This involves not only direct contact with people in the world of illicit, but also the effects that substances have on the brain. A brain rendered dysfunctional by drugs can cause learning problems (Dong and Krhon, 2020). So, it was not surprising to find positive correlations between drug use and a worsening of CU traits with externalizing behaviours.

These investigations are of great importance, since understanding the reasons for the lower performance of students with CU traits could allow to build a targeted didactic methodology not only in schools, but also in the places of detention of young people in the justice systems (e.g. Beye. 2019).

Our findings let us assume that one intervention should be addressed to motivational processes (Gopalan et al., 2017). Then it is possible to improve a more analytical part of learning, using instruments that allow a "progressive conditioning" (LeungandShek, 2021; Garrison, 2018). If students with CU traits learn better though an analytic pattern, it could be useful to divide a task in frames, each of one containing a specific knowledge that can be linked to another frame by frame. The learner could be in front of questions whose answers allow him/her to advance. Right answers could work as a positive reinforcement, while negative ones could be re-proposed with a different logic (Oba and Ohira, 2019). These new instruments are now widely proposed and use artificial intelligence (AI) technologies. Even if they were thought for other special needs, it is possible (and desirable) to include CU traits in special need. In fact, it is now evidenced that we are facing a different brain functioning, with specific learning and behavioural patterns. Thornier is to deal with the individual study preference because students with CU traits really need to improve their emotional and relational faculties and this cannot be forgotten. They should be trained on empathy, on the understanding of their own emotions and those of others (Blair, 2017; Emandi, 2020).

From a statistical point of view, we applied tandem analysis for its mathematical properties and abundance of useful, interpretative graphical displays. However, tandem analysis alternatives recently proposed (Markos, Iodice D'Enza, van de Velden, 2019) could be investigated. These methods apply dimensionality reduction techniques and classification techniques jointly, not in succession. For the qualitative variables, we could consider MCA K-means (Hwang, Dillon and Takane 2006), i-FCB (Iodice D'Enza and Palumbo 2013) Cluster Correspondence Analysis (van de Velden, Iodice D'Enza and Palumbo 2017) combining MCA and the K-means algorithm.

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Appendix 1

Table 1: Questionnaire

	Questions/variables	Labels
CU trait	I do not care who I hurt to get what I want	Call_4
	I do not care about being on time.	Call_7
	I am concerned about the feelings of others	Call_8
	I do not care if I get into trouble	Call_9
	I do not care about doing things well	Call_11
	I seem very cold and uncaring to others	Call_12
	I do not feel remorseful when I do something wrong	Call_18
	I do not like to put the time into doing things well	Call_20
	The feelings of others are unimportant to me	Call_21
Area A – Kinesthetic	When I study, emphasize or highlight words and phrases I concentrate more	Cin_1
Area B – Global	I like to work without planning everything in the beginning	G_2
Area C – Individual	I prefer that the teacher assigns us jobs that each of us can carry out as he wants	I_3
Area A – Visual not verbal	It's difficult to understand a term or concept if I don't have examples	Vnv_4
Area A – Visual verbal	I am confused by graphs and diagrams that are not accompanied by written explanations	Vv_5
Area B – Analityc	I prefer jobs that can be done step by step, completing one task before starting the next	A_6
Area A – Kinesthetic	I remember a topic better if I can have direct experience, for example by doing a laboratory experiment, building a model, doing research, etc.	Cin_7
Area A – Visual verbal	I'd rather learn from a book than from a lesson	Vv_8
Area B – Global	I am satisfied if a topic I understand the general ideas, without considering the details	G_9
Area A – Auditory	I understand a subject better by talking or discussing it with someone rather than just reading a text	U_10
Area C – Group	I like working in a group	Gr_11
Area A – Visual not verbal	When I study a book I learn more by looking at figures, graphs and maps rather than reading the written text	Vnv_12
Area B – Analityc	If I have to tell or report something I dwell a lot on the details	A_13

	Questions/variables	*Labels*
Area A – Auditory	I can easily follow someone who talks even if I do not look him in the face	U_14
Area A – Visual verbal	I understand better the instructions of a task if these are written	Vv_15
Area C – Individual	If I have to work in groups, I prefer the teacher to decide how to form groups	I_16
Area A – Kinesthetic	During a lesson or discussion, writing or drawing helps me to concentrate	Cin_17
Area C – Individual	I learn and remember more when I study alone	I_18
Area C – Group	In a group job I prefer that the teacher leaves us free to distribute the tasks	Gr_19
Area B – Analityc	I organize my time, both in the studio and in other activities	A_20
Area A – Visual not verbal	When I read a text I mentally create images about the story, characters or ideas	Vnv_21
Area A – Kinesthetic	When I study I need frequent breaks and physical movement	Cin_22
Area C – Group	At the end of a group work I feel I have learned more than if I had worked alone	Gr_23
Area B – Analityc	I prefer closed-ended questions rather than ope-ended ones	A_24
Area C – Individual	I feel like I'm wasting my time when in class I work with a classmate or in group	I_25
Area A – Visual not verbal	For me it is easier to remember figures and illustrations that are printed in bright colors in a book	Vnv_26
Area B – Global	I learn better if I start from a general description of the problem rather than a specific aspect	G_27
Area B – Analityc	I prefer a clear description of a rule or a theory before applying it in exercises	A_28
Area A – Visual not verbal	To understand a text I'm studying I help myself by making drawings and diagrams	Vnv_29
Area C – Group	I learn more in class than when I study at home	Gr_30
Area A – Kinesthetic	I don't like to read or listen to instructions for a task, I prefer to start working on it immediately	Cin_31
Area A – Auditory	I understand better if the instructions for a task are explained to me orally and not only provided in writing	U_32
Area C – Group	If a task is to be done in groups, I prefer that the students themselves form the groups	Gr_33
Area A – Visual verbal	I take notes during the teacher's explanations and then reread them on my own	Vv_34

	Questions/variables	*Labels*
Area B – Global	For me it is quite easy to summarize what has been said in a discussion	G_35
Area A – Auditory	When I study, I concentrate more if I read or repeat aloud	U_36
Area C – Individual	I learn more at home than in class	I_37
Area B – Global	If I have to decide if something is right or correct, I rely more on instinct than logic	G_38
Area A – Auditory	I'd rather learn by watching a video or listening to an audio than reading a book	U_39
Area A – Visual verbal	When I study I take notes or make summaries	U_40