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Determinants of Post-Traumatic Stress Disorders in Italian university students during the Covid-19 outbreak: the leading role of sex, health concerns, and health engagement

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Key words: COVID-19 outbreak, Post-Traumatic Stress Disorder, PTSD, Psychological distress, Risk and protective factors, University students
Parole chiave: Epidemia Covid19, Disturbo post-traumatico da stress, DPTS, Disagio psicologico, Fattori di rischio e di protezione, Studenti universitari

Abstract

Background. *The unprecedented changes in daily-life caused by Covid-19 restrictions had many psychological and adverse effects, not only in sufferers but also in the general population, including university students. To date, little is known about Post-Traumatic Stress Disorder symptoms experienced by university students during the peak of Covid-19 in Italy. Thus, the study describes Post-Traumatic Stress Disorders related to the Covid-19 outbreak among Italian university students and identifies the psychological distress risk and protective factors.*
Study design. *A multicentre observational cross-sectional study.*
Methods. *Data collection was involved in a self-reported web questionnaire, using the on-line platform Qualtrics®, in March and April 2020, involving convenience and consecutive sampling of Italians university students in different Italy regions.*
Results. *A sample of 720 Italian university students was enrolled. Data analysis highlighted the leading role of sex, health concerns, and health engagement as negative or positive determinants of Post-Traumatic Stress Disorders in Italian university students during the Covid-19 outbreak. In particular, it is very insightful having discovered that health engagement is a protective factor of students' mental health.*
Conclusions. *This is the first study identifying sex, health issues and health commitment as positive or negative determinants of Post-Traumatic Stress Disorders symptoms in Italian university students during the Covid-19 epidemic. Accordingly, this new achievement could be the starting point for the development of awareness campaigns for the psychological health of Italian university students.*

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Introduction

The novel "Coronavirus 2019 disease" (Covid-19) - a severe acute respiratory syndrome whose agent has been named "SARS-CoV-2" – quickly became an international public health emergency (1), and - since the beginning of January 2020 - began to spread in Italy. Subsequently, on March 8, 2020, the Italian government adopted restrictive measures to contain the virus, such as the closure of schools and all in-person university services, transportation restrictions, smart working, and the suspension of activities that did not produce or supply primary goods (1). These unprecedented changes in daily life had many psychological and adverse effect, not only in sufferers but also in the general population (2), including university students (3-5).

The rapid and profoundly modification of university programs and the way to provide university formation - i.e., switched from in-person to online learning, using emails for day-by-day relationship, using university Intranets to communicate (1) – were accompanied by increases in global psychological distress in university students (3). Specifically, the imposed quarantine or isolation during the Covid-19 era resulted in cognitive distress, negative emotions, and aggressiveness due to the fear of Covid-19 in university students, reducing sleep quality, or a sense of numbness (6). Cao et al (7) highlighted that nearly 24.9% of college students in China reported anxiety symptoms. Interestingly, a recent survey on 2038 Chinese university students reported anxiety, depressive symptoms, and post-traumatic growth: 15.5%, 23.3%, and 66.9%, respectively (4).

The results of the survey performed by Chi et al. (2020) discovered, for the first time, that a significant proportion of young adults and university students (30.8%) exhibit clinically relevant Post-Traumatic Stress Disorder (PTSD) (4). PTSD is a form of mental distress that develops following highly traumatic experiences, such as the Covid-19 outbreak (8). PTSD can manifest itself in people of all ages, from children and adolescents to adults and the elderly, and it can also occur in family members, witnesses, rescuers involved in a traumatic event. Some experts have advanced a different hypothesis, that the development of PTSD depends on personal characteristics, and they have investigated possible measures to mitigate negative emotions (9). In the United States, the National Institute of Mental Health monitors an estimated 5.2 million Americans between 18 and 54 years (or 3.5 per cent of people in this age group) with PTSD. Besides the two common negative emotions, PTSD symptoms were also reported with 16.6% of 1,081 college students (4, 10).

Studies indicate that women are much more prone to developing PTSD following exposure to trauma, and other categories at particular risk are children, adolescents, and the rescuers themselves (11). The rates of PTSD also depend heavily on the event that produced the trauma. For example, PTSD can develop in 2% of survivors after a natural event such as a tornado, in 28% of people involved in a mass terrorist attack, in 29 % of survivors and family members of victims of air disasters (12, 13). Studies on the spread of PTSD have also been carried out in the case of the wars in the former Yugoslavia, the terrorist attack on the two towers of New York, the conflicts in Iraq, and in the case of natural disasters (14, 15).

Therefore, we believe that university students experienced PDTS symptoms during the peak of Covid-19 in Italy (March–April 2020). However, few authors deepened the phenomena to date; in particular, there is a lack of evidence about investigating the risk and protective factors of PTSD symptoms. In this regard, Nania et al (16) opened a new research line, bringing out the beneficial role of health engagement. Notably, they

explored the associations between PTSD and risk and protective factors; the authors preliminary found that the students' level of health engagement seems to mitigate the effects of negative risk factors and to amplify the ones of the protective factors on their reported mental health status (16). However, more cross-national research is needed, and it would be worthy of improving knowledge on the psychological mechanisms requested to university student populations for the achievement of the well-being status, despite experiencing a stressful context like the one determined by the Covid-19 pandemic. According to these premises, this study aims to describe the level of PTSD related to the Covid-19 outbreak among Italian university students and to identify the psychological distress risk and protective factors.

Methods

Study design, participants, and setting

A multicentre observational, cross-sectional study was conducted, involving convenience and consecutive Italian university students samples in different Italy regions. The inclusion criteria were: the respondents are (a) university students, (b) over 18 years old, (c) available to participate in the study, (d) being able to read and understand Italian, and (e) live in Italy.

Data collection was carried out to assess a self-reported web questionnaire (i.e., survey) using the online platform Qualtrics®. The survey was created in February 2020, during the phase one of the Covid-19 outbreak in Italy. It was administered in March and April 2020, which were the months where the Covid-19 outbreak reached its first peak in Italy. The choice to perform an online survey was based on the ease of use considering the responders' perspective, such as the adaptable layout for fitting with the user device for answering (e.g., mobile, laptop), and considering that the internet connection is often available to the broader public. People may answer more freely than they would with telephone or paper surveys, and there is no need for data entry, as the online form directly collects the participants' answers and effortlessly exports these as a dataset.

After the online questionnaire development, a specific link was generated to the platform to enrolled university students. The research team carried out the recruitment in two different ways: firstly, by direct invitations to university students via social media, for example Facebook or Linkedin (publication on personal pages or pages of the university students' group); secondly, by involving coordinators from the university centers of Italy, purposively invited using a convenience sampling approach. Besides, each student involved could invite other volunteer students to answer the survey (snowball sampling approach). The authors have suggested that the participants needed about 20 minutes to complete the survey.

Survey development and measures

The research team performed data collection through the following measurements and approaches. According to recommendations for the conduction of the survey (17), the self-reported web questionnaire consists of four different sections. They are (a) the form for collecting the socio-demographic and degree characteristics; (b) the measures of distress caused by traumatic events; (c) the orientation towards patient engagement; and (d) the assessment of feelings of awareness and health concerns derived from the Covid-19 pandemic, using previously validated items created *ad hoc*.

Socio-demographics characteristics collected were sex (male, female), age (years), marital status (unmarried or married), nationality (Italian, other), the specific living area during the Covid-19 outbreak, asking participants to indicate

Northern, Central, and Southern Italy-Islands. Additionally, the specific stayingt in a "Red zone" during Covid-19 Outbreak has been collected using a self-report approach. Likely, the academic degree (Healthcare students or non-Healthcare students) and educational background (base or post-base) were collected. The measures of distress caused by traumatic events (namely PTSD) was performed using the Impact of Event Scale-Revised (IES-R) (18, 19) composed of a self-report 22-item.

Respondents were asked to identify a specific stressful life event and then indicate how much they were distressed or bothered during the past seven days by each "difficulty" listed. Items are rated on a 5-point scale ranging from 0 ("not at all") to 4 ("extremely"). The IES-R yields a total score (ranging from 0 to 88), and subscale scores can also be calculated for the Intrusion, Avoidance, and Hyperarousal subscales.

The orientation towards engagement was assessed by administering a revised version of the Patient Health Engagement Scale (PHE-s®), and the revision was authorized and supervised by the authors of reference (20). This scale was composed of five ordinal items reflecting the continuum of engagement described in the PHE model's four levels. According to the ordinal nature of the PHE-s®, the median score is considered the more reliable index to calculate the final patients' scoring. It was developed according to the Patient Health Engagement model and assessed the student's health engagement level, defined as the "*people psychological readiness and sense of mastery to become an active player in their own health management and health risk prevention*". Recent studies demonstrated its robust psychometric properties. The scale assumes that the person's score should reflect his/her actual health engagement level. For this study purposes, the PHE-s® was slightly revised to adapt the items' formulation to the specific context of the health emergency. The incipit was revised contextualizing the Covid-19 emergency (from "thinking about your health" to "thinking about your health in this emergency"). Accordingly, the new incipit and a slight edit of the fifth item allowed the authors to adopt the revised PHE-s® to explore orientation to health engagement during the Covid-19 pandemic in a general population, such as for university students.

The measures of feelings of awareness and health concerns derived from the Covid-19 pandemic were developed *ad hoc*, as no reliable and valid tools were found to fit with the characteristics derived from the outbreak. Therefore, participants were asked to rate their agreement to seven statements regarding awareness and seven statements for feelings of health concerns. The wording of each statement was discussed among authors to reach a consensus in defining the items as clear and pertinent to what it pursuits to measure. Additionally, to guarantee a good psychometric structure of the measurement, a principal component analysis was performed. Each item needed to be answered using a six-point Likert scale to generate the items as discrete answers.

Statistical analysis

Data analysis was conducted in three different steps. Firstly, an initial data check, descriptive statistics, and correlational analysis were performed (step one): specifically, we conducted an initial data check, missing information, errors, or outliers using the frequency check; besides, we conducted descriptive statistics correlational analysis. Descriptive statistics were used to summarize the characteristics of the sample, where mean and standard deviation (SD) were used for normally distributed continuous variables, while frequency and percentage were used for nominal/ordinal variables.

After that, the dimensionality of the ad hoc developed items and two subscales were

tested, applying a Principal Component Analysis (PCA) with Promax rotations to support the scoring procedure and decrease measurement bias (step two). Indeed, PCA is a technique for reducing such a data set dimensionality, increasing its interpretability, and minimizing information loss (21). Scree plot and eigenvalues were used to decide the number of factors to be extracted. Two statistical tests were used to define whether the sample and the correlation matrix obtained from their answers were suitable for PCA: the Bartlet Test of Sphericity and the criterion Kaiser-Meyer Olkin Measure of Sampling Adequacy (KMO). Finally, Cronbach's αwas assessed to evaluate the questionnaire reliability by describing each extracted component's internal consistency.

Finally, the effects of the protective and risk factors on PTDS were assessed by multiple linear regressions (MLR). Before performing the MLRs, MLRs were used to assess the associations between the protective-risk factors (covariates) on PTDS total and its third subscales (i.e., Intrusion, Avoidance, and Hyperarousal subscales). During this exploratory phase, the comparisons between mean scores of responders from a red zone and those external to a red zone were performed regarding the dependent variables (avoidance, hyperarousal, intrusion, total IES), and also considering health engagement (adapted PHE-s®), awareness to Covid-19 outbreak, health concern to Covid-19 outbreak). This approach was performed to detect possible differences in the answers for determining whether a subgroup analysis could increase the likelihood of highlighting insightful associations: no significant differences emerged (all P higher than 0.85). For this reason, no subgroup analyses considering the provenience from a red zone have been performed. Accordingly, independent variables were included simultaneously in the MLR models, and they were: education level, sex, awareness, health concerns, and PHE Score. The strength of each independent variable to predict the variance of dependent variables was reported as a standardized beta coefficient (β), where the higher the absolute value of the beta coefficient, the stronger the effect. The least-squares estimate method was used to determine the coefficients of the MLR models. Data were analyzed through Statistical Package for the Social Sciences (SPSS) version 22 (IBM Corporation), by adopting α=5% and two-tailed null hypotheses.

Ethical considerations

The research was conducted according to international ethical principles, and the study was approved by the Ethical Committee and the Institutional Review Board of the involved center. All participants voluntarily gave their informed consent to participate in the study after being informed about its purpose. All the enrolled university students signed an online consent form before completing the questionnaire. This study's procedures complied with the provisions of the Declaration of Helsinki regarding research on Human participants.

Results

Participant characteristics

A sample of 720 university students from Italy was enrolled in this study. Participants' socio-demographic characteristics are shown in table 1. The majority of participants were female (n=573, 79.6%), with an average age of 23.5 years (SD=3.7), and Italian (93.5%). Specifically, they come from to 3 Italian zones: Northern (n=511; 72.4%), Central (n=84; 11.7%) and Southern and islands (n=86; 11.9%). Regarding the academic degree of the sample, 84.9% (n=611) of students attended a bachelor's degree, and 76.5% (n=551) of them are healthcare students, and 23.2% (n= 169) are non-healthcare students.

Table 1 - Socio-demographic characteristics of the sample (N=) 720

		No.	%
Sex			
	Male	139	19.3
	Female	573	79.6
	Missing	8	1.1
Age			
	years (mean; SD)	23.52	3.7
Nationality			
	Italian	673	93.5
	Other	47	6.5
Italian regions			
	Northern	511	71.0
	Central	84	11.7
	Southern and Islands	86	11.9
	Missing	39	5.4
Marital status	Single/divorced	638	88.6
	Married	82	11.4
Academic degree			
	Healthcare students	551	76.5
	Non healthcare students	169	23.5
Education level			
	Bachelor's degree	611	84.9
	Master's degree	83	11.5
	Other	17	2.4
"Red zone" during Covid-19 Outbreak*			
	Yes	438	60.8
	No	243	33.7
	Missing	39	5.4

* resident in an area officially declared in special emergency because of Covid-19

The dimensionality of the ad hoc developed scales

We tested dimensionality of the *ad hoc* developed items on feelings of awareness and health concerns derived from the Covid-19 pandemic. A scree plot suggested two factors to be extracted: the adequacy indicator of the sample KMO=0.809>0.70 indicated that the sample data are suitable for the undergoing of factor analysis. The test of sphericity (Chi-square$_{(120)}$=2256.15; P<0.001) showed that the principal component analysis was feasible. All 14 items of the instrument were analyzed with the PCA, showing good factor loadings: seven items loaded significantly at one factor, whereas nine items loaded significantly at two factors. Thus, two factors extraction were confirmed: health concerns (items 1-7) and awareness (items 8-15), explaining 34.8% of the total variance (see Table 2). Additionally, we standardized each subscale score to 0-100. The scale does not include items to be reversed. For this reason, to standardize each domain score, it is needed to subtract the possible minimum score from the sum of the items for each domain; then multiply (the result from the sum) by the division between 100 and the difference between the maximum and minimum score: health concerns = [sum(item1, item2, item3, item4, item5, item6, item7)-7)*(100/38)]; awareness = [sum(item8, item9, item10, item11, item12, item13, item14, item15)-8)*(100/40)]. The Cronbach's alpha reliability coefficient was 0.65 for the health concerns subscale and was 0.69 for the awareness subscales (see Table 2).

Scores of scales

Table 3 showed the descriptive analyses of the applicated instruments and their subscales: the measures of distress caused by traumatic events (PTSD) and Intrusion, Avoidance, and Hyperarousal subscales, the orientation towards patient engagement (PHE-s®), and awareness and health concerns derived from the Covid-19 pandemic.

Determinants of PTDS: protective and risk factors

As described in Table 4, the proposed models were adequate, both IES total score [R^2=0.286; (F=56.373; P<0.001)] and its

Table 2 - The dimensionality of the ad hoc developed scales

		Awareness	Health concerns
Item_1	How worrid are you?	-0.015	**0.654**
Item_2	How much do you think you are at risk of contagion from the new Coronavirus (COVID-19)	-0.061	**0.742**
Item_3	I am worried because I am thinking of contracting Covid-19	0.069	**0.767**
Item_4	In case I was infected, I think I would heal quickly	0.264	**-0.436**
Item_5	In case you get infected, I think there is little chance of recovery	-0.062	**0.485**
Item_6	I am afraid that people close to me may contract COVID-19	0.267	**0.412**
Item_7	People close to me are worried for my health	0.212	**0.482**
Item_8	I feel more aware of behaviours and health and hygiene prevention measures	**0.706**	-0.049
Item_9	I consider it important to focus on the present rather than the future	**0.357**	0.050
Item_10	I have become more aware of my state of health	**0.590**	0.136
Item_11	I feel able to detect the symptoms of COVID-19 (agree / disagree)	**0.526**	-0.261
Item_12	I am sure that the institutions protect all people infected with COVID-19	**0.412**	-0.254
Item_13	I feel more aware of the value of civic responsibility	**0.699**	0.075
Item_14	I feel my actions can make a difference in controlling COVID-19 infection	**0.615**	-0.031
Item_15	I feel more aware of the importance of taking care of others	**0.745**	0.023
Explained Variance (34.81)		**13.05**	21.76
Cronbach's alpha		0.699	0.655

Table 3 - Descriptive analyses of instruments used and their subscales

	Means	DS
PHE_Score	2.6	0.6
Avoidance	2.1	0.7
Hyperarousal	2.0	0.7
Intrusion	2.5	0.6
Total IES	6.6	1.7
Awareness to Covid-19 outbreak	72.3	13.3
Health Concern to Covid-19 outbreak	52.1	18.3

subscales: Avoidance [R^2=0.257; (F=48.87; P<0.001)]; Hyperarousal [R^2=0.206; (F=36.553; P<0.001)]; Intrusion [R^2=0.197; (F=34.59; P<0.001)]. In this regard, our results highlighted the leading role of sex, health concerns, and health engagement as negative or positive determinants of PTSD in Italian university students during the Covid-19 outbreak.

Specifically, to be female were found to be slightly associated with higher scores of IES total score (β=0.149, P<0.001), and its three subscales: Avoidance (β=0.116, P<0.001); Hyperarousal (β=0.117, P<0.001); Intrusion (β=0.161, P<0.001). Additionally, a higher level of health concerns to the Covid-19 outbreak was associated with a higher level of IES total score (β=0.210, P<0.001), and its three subscales: Avoidance (β=-0.206, P<0.001); Hyperarousal (β=0.165, P<0.001); Intrusion (β=0.177, P<0.001). Finally, health engagement was identified as positive predictor (i.e., protective factors) of scores of IES total score (β= -0.392, P<0.001), and its three subscales: Avoidance

(β= -0.379, P<0.001); Hyperarousal (β= -0.350, P<0.001); Intrusion (β= -0.293, P<0.001).

Discussion

To the best of our knowledge, this empirical study aimed to describe for the first time the level of PTDS related to the Covid-19 outbreak among Italian university students and to identify the psychological correlates in terms of risk and protective factors. Currently, Italy has around 1.721.790 university students; thus, the psychological impact of the new Covid-19 emergency and the changes in daily life can be considered a public health concern (22), and the mental health and safety of university students should be the top priority (23). In contrast to other life stressors, as the Covid-19 infection can spread rapidly with major health consequences, it is perceived as an uncontrollable stressor that may cause an intense feeling of anxiety and panic. Even more, given the current worldwide concern over the Covid-19 epidemic, studies on the prevalence and risk factors for PTDS could be particularly useful for university managers to prevent, target, or deal with negative psychological consequences of epidemics on university students' population (23).

Overall, our study appears to be innovative, having discovered the leading role of sex, health concerns, and health engagement as negative or positive determinants of PTSD in Italian university students during the Covid-19 outbreak. Sex played a role in determining the experience of psychological distress and PTSD. According to our findings, female students were more exposed to the risk of developing PTSD symptoms than males. This result confirms other studies that found the same evidence (11, 24). From a psychobiological perspective, sex has been found to be an important biological determinant of the individuals' vulnerability to psychological distress, and sex-related differences have been identified in the brain activation when exposed to stressful stimuli (25). Moreover, our findings corroborate previous research evidence about the link between the level of health concern and stress symptoms (7, 24).

Finally, this study offered a novel contribution to understanding the factors involved in the development of PTSD symptoms, by demonstrating the protective role of individuals' health engagement. In particular, we discovered that the more people are willing to take an active role in their health management and are aware of their power to control their health processes, the less they experience PTDS or stress-related symptoms. This effect confirms previous insights about how people may adaptively cope with stressful situations in a resilient manner and react with the strength to personal and social adversity (26) through the process of psychological adjustment and engagement. Our results are consistent with previous findings that examined the role of individuals' health engagement and activation in determining psychological-related outcomes, that resulted in greater health engagement related to higher recovery levels, better quality mental health care, better physical and mental health, and fewer mental health symptoms. Besides, more activated individuals, engaged in better mental health self-care, were more likely to take psychiatric medications as prescribed and reported greater satisfaction and symptom control from their psychiatric medications (27, 28).

Limitations of the study

This study had some limitations. Firstly, the adopted observational design of cross-sectional data collection did not provide information before and after the Covid-19 outbreak; this undermined the possibility to determine the trajectory of the described associations over time.

Secondly, the sampling had a convenience e snowball approach; this suggests caution in interpreting the inferential analyses, as it is a nonprobability sampling technique where existing study subjects recruit future subjects from among their acquaintances. Thirdly, other psychological outcomes (i.e., self-efficacy (29-31), burnout (32), professional values (33) or health and professional behaviours (34-37) or organizational care model (37-40) could have a positive or negative impact, that was not assessed in this study. Other possible confounders that were not collected were the responders' health status and the presence of relatives with Covid-19. It is plausible that, by controlling the analysis and the possible interplay of these variables, the resulting associations from the independent variables to the PTSD could reflect the reality with much precision. Then, this limit acknowledges that self-efficacy, burnout, values, perceptions of the organizational models to manage the outbreak, the perceived health status, and the presence of relatives with Covid-19 could influence the associations between the described determinants and PTDS through a moderating effect. For this reason, the results arising from this study should be further corroborated by future research.

Conclusion

For the first time, our study described the strategic role of sex, health concerns, and health engagement to positively or negatively impact the PTSD symptoms of Italian university students during the Covid-19 outbreak. These results could have important consequences on the development of sensitizing campaigns tailored to Italian university students' psychological health needs. It is particularly fascinating and useful, having discovered that health engagement is a protective factor of students' mental health. Accordingly, health engagement - i.e., people's psychological readiness to be an active player in their health management - is a modifiable determinant, and educational initiatives could enhance its levels. Overall, future research should consider health engagement as a protective determinant to prevent distress and PDTS after exposure to the Covid-19 emergency.

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Conflict of interest. The authors declare no conflict of interest.

Riassunto

Determinanti del Disturbo da Stress Post-Traumatico in studenti universitari italiani durante l'epidemia di Covid-19: il ruolo chiave di sesso, preoccupazioni legate alla salute ed health engagement

Premessa. I numerosi cambiamenti della vita quotidiana per fronteggiare l'epidemia di Covid-19 hanno causato molti effetti avversi e psicologici, sia nei pazienti che nella popolazione in generale, e quindi anche sugli studenti universitari. Ad oggi, si conosce poco il Disturbo Post-Traumatico da Stress vissuto dagli studenti universitari durante la pandemia Covid-19 in Italia. Pertanto, questo studio vuole descrivere il Disturbo Post-Traumatico da Stress in seguito a pandemia Covid-19 tra gli studenti universitari italiani, ed identificarne i fattori determinanti e protettivi.

Disegno dello studio. È stato condotto uno studio trasversale osservazionale multicentrico.

Metodi. La raccolta dei dati è stata svolta con la somministrazione di un questionario via web, utilizzando la piattaforma online Qualtrics®, nei mesi di marzo e aprile 2020. Il campionamento è stato di convenienza e consecutivo e ha visto coinvolto studenti universitari italiani in diverse regioni d'Italia.

Risultati. 720 studenti universitari italiani hanno partecipato allo studio. L'analisi dei dati ha evidenziato il ruolo strategico ricoperto dal genere, la preoccupazione per la salute, ed l'impegno per la salute, come determinanti negativi e positivi dello sviluppo di Disturbo Post-Traumatico da Stress negli studenti universitari italiani durante l'epidemia Covid-19. In particolare, l'impegno per la salute è un fattore protettivo della salute mentale stessa negli studenti.

Conclusioni. Questo è il primo studio che ha scoperto che il genere, la preoccupazione per la salute, e l'impegno per la salute possono determinare in modo positivo o negativo i sintomi di Disturbo Post-Traumatico da Stress negli studenti universitari italiani, durante l'epidemia di Covid-19. Di conseguenza, il nuovo punto di vista potrebbe essere il punto di partenza per lo sviluppo di campagne di sensibilizzazione per la salute psicologica degli studenti universitari italiani.

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