Existing evidence and the diathesis-stress model hypothesis suggest that stress as an environmental factor may trigger the onset of psychiatric disorders, such as psychosis spectrum disorders, mood disorders, anxiety disorders, in people with an underlying vulnerability. The purpose of this study was to determine the period of time during military service at which symptomatology of clinical significance is more often developed, considering that stress of service and adaptation to its requirements is common to all army recruits. A retrospective file study for the years 2017–2018 was conducted in order to identify male soldiers who were hospitalized in the psychiatric clinic of 414 Athens Military hospital and diagnosed as F20–29, F30–39 and F40–48 according to ICD-10. The number of hospitalizations per clinical diagnosis and the time of onset relatively to the month of military service were examined. A total of 139 cases were screened, 119 of which had disorders falling into the diagnostic categories F20–29, F30–39 and F40–48. 53% of total hospitalizations took place within the first two months of a nine-month military service. It was found that the risk of disorder onset within the first two months of military service was statistically higher (OR=0.210, p=0.001) for a schizophrenic spectrum disorder (F20–29) compared to F30–39 and F40–48 disorders. After adjusting for potential confounders, such as heritability for psychiatric disorders, urbanicity, history of substance use or age, the risk for hospitalization within the first two months continued to be significantly predicted by F20–29 disorder (OR=0.255, p=0.022) compared to other diagnoses. Individuals vulnerable in developing a psychotic disorder appear to have lower stress tolerance and may manifest an earlier disease onset, when exposed to the stress of military service compared to subjects predisposed to develop mood or anxiety disorders. Stress during military service is of major importance for the emergence of the whole psychopathology spectrum, particularly in vulnerable individuals. The development of prevention and early intervention strate-
Introduction

According to the diathesis-stress hypothesis and the biopsychosocial model, psychiatric disorders arise as a consequence of the interaction between genetic, biological predisposition and environmental stress. The term "diathesis" describes a person's vulnerability determined by genetic, biological or psychological factors, whereas the term "stress" refers to a major psychosocial event or to a series of minor stressful experiences that may result either in an acute or in a gradual and cumulative burden on someone's mental health and functionality. "Diathesis" presents a resilience threshold. Below this threshold, the clinical phenotype is not expressed, regardless of the stressful event; above it, a psychiatric disorder may be expressed after the individual has been exposed to a certain "quantity" of stress. The hypothesis of diathesis-stress model was originally formulated as a potential pathophysiological mechanism concerning the onset of psychotic disorders and schizophrenia (including the hypothalamic-pituitary-adrenal axis function; neurodevelopmental, epigenetic, neurotransmission, inflammatory processes) and now represents an integrated neurobiological model that provides a mechanistic link between stress biology and the development and progression of psychosis. Furthermore, the role of stress has been studied for many years through the prism of the diathesis-stress model also in other major psychiatric disorders such as depression, bipolar disorder and anxiety disorders. The research expansion of the diathesis-stress model is otherwise known with the term "gene-environment interaction" (GxE), indicating the effect of environmental factors on the individual's genotype. It is more evident nowadays that, regarding the etiopathogenesis of major psychiatric disorders, there is a strong interplay between biological predisposition and environmental factors, such as childhood trauma, cannabis use, migration, urbanity, which either shapes a stress-dysregulation vulnerability during the premorbid period or imposes stress above an individual's resilience threshold, such as major stressful events.

Military service can be considered as a potentially major stressful event that affects vulnerable individuals or individuals with low stress threshold. During military service the individual is required to adapt to a demanding environment that operates under hierarchy, regulations and restrictions. This military framework implies separation from family and friends, in many cases for the first time in someone's life, obligatory coexistence with unknown individuals of different cultural and educational backgrounds and moreover disciplined training using weapons under adverse conditions and limited hours of sleep. Previous studies concerning military service have found that despite the psychiatric assessment preceding the conscription, there are many individuals that experience a major psychiatric episode (first episode psychosis, schizophrenia, depression, bipolar disorder) for the first time in their lives during the military service period. The adaptive stress predisposes to subsequent emergence mainly of anxiety disorders, but has also been associated with psychosis onset, early during the military service period. As the adaptation to military life can be a framework of a naturalistic study for the impact of psychosocial stress on psychologically predisposed individuals, it would be interesting to study the diathesis-stress model in relation to the onset of major psychiatric disorders.

The purpose of the present study was to examine the diathesis-stress model in regards to the three major diagnostic categories (psychotic/schizophrenic spectrum disorders, mood disorders and anxiety disorders) by determining the period of time during military service at which symptomatology of clinical significance is more often manifested. The research hypothesis is that...
individuals who suffer earlier during the military service period may have lower stress threshold, considering that stress of army service and adaptation to its requirements is common to all army recruits. A secondary aim is to study well-known risk factors which could form a stress vulnerability, such as heritability for psychiatric disorders, substance use and urbanicity. To our knowledge, there has been no previous study with comparisons between the major psychiatric disorders relating to the diathesis-stress model.

Material and method

In this retrospective medical file study, 139 cases of male soldiers were identified, who had been hospitalized in the psychiatric clinic of 414 Athens Military hospital during 2017 and 2018 and received an ICD-10 diagnosis. From these records, we used 118 cases which fell into the following diagnostic categories according to ICD-10: F20–29, F30–39, F40–48. We excluded cases with substance use related disorders which did not manifested comorbidity with other major psychiatric disorders. Cases with diagnoses F60–69 were also excluded, considering that personality disorders are a chronic condition (trait) and not a first occurrence of clinical symptomatology (state). Individuals who were previously or during their military service treated for any psychiatric disorder were also excluded, as our study focused on the effect of psychosocial stress on the onset of psychiatric disorders without the protective effect or symptomatology delay that a treatment may offer. From the medical records that were eventually used, apart from data relating to ICD-10 diagnosis and the month of military service period when soldiers were hospitalized, we also collected data about age, heritability for mental illness, reported substance use both before and during recruitment, and urban residence (great urban center with a population of over 500,000 inhabitants or not).

In order to increase statistical power, since the 53% of the hospitalizations took place during the first two months of the military service period, we converted the variable of interest for the hospitalization month from continuous to binary (1=first two months, 2=remaining seven months of service). We also divided cases into three groups based on ICD-10 psychiatric diagnoses (1=F20–29, 2=F30–39, 3=F40–48). We performed statistical analysis using logistic regression to estimate the probability of disorder onset in the first two months of the military service period, compared to the following months. In the second phase of the analysis, we adapted the model for potential confounding factors, such as heritability, substance use, urban residence and age at disorder’s onset. All analyzes were performed using the statistical package SPSS version 25.0.

Results

Our final sample consisted of 118 individuals (all males). The average age of the subjects when hospitalized was 22.5 years (SD=±3.064), 50% (n=59) were living in a large urban center, 17.8% (n=21) reported heritability for mental illness, 22.1% (n=25) reported a history of substance use, of which 44% (n=11) reported recent use (within last month).

Regarding to the distribution of hospitalizations per month of military service, 38.1% (n=45) of the hospitalizations took place during the first month of service period, 15.3% (n=18) during the second month, while the remaining 46.6% (n=55) from the third to the 9th month, when the military service period is completed (figure 1).

Diagnoses were distributed as follows: anxiety disorders (F40–48) 59.3% of total sample (n=70), we also divided cases into three groups based on ICD-10 psychiatric diagnoses (1=F20–29, 2=F30–39, 3=F40–48). We performed statistical analysis using logistic regression to estimate the probability of disorder onset in the first two months of the military service period, compared to the following months. In the second phase of the analysis, we adapted the model for potential confounding factors, such as heritability, substance use, urban residence and age at disorder’s onset. All analyzes were performed using the statistical package SPSS version 25.0.

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schizophrenic spectrum disorders (F20–29) 29.7% of total sample (n=35), and mood disorders (F30–39) 29.7% of total sample (n=13). These three diagnostic groups were further distributed according to the month of military service period when hospitalization took place (figure 2). As demonstrated in the diagram of figure 2, for those who were hospitalized and diagnosed as F20–29 the disorder’s onset takes place mainly during the first two months of military service, while for the first two months less individuals were hospitalized as F30–39 and F40–48.

From the logistic regression analysis, it is clear that the onset of mental illness within the first two months of military service is predicted with statistical significance from schizophrenic/psychotic spectrum disorders and not from the other diagnostic categories (table 1). After adjustment for confounding factors such as heritability for mental illness, substance use, urban residence and age, the onset of psychiatric disorder within the first two months of the military service continued to be predicted with statistical significance from the variable F20–29, while the other diagnoses did not appear to be related with early onset during the service period (table 1).

Discussion

Our study attempted to determine the period of time during military service at which major psychiatric disorders are developed, specifically psychotic/schizophrenic spectrum disorders, mood disorders and anxiety disorders. According to diathesis-stress model, we hypothesized that psychosocial stress during military service may trigger the onset of major psychopathology, resulting in more hospitalizations during the first months of the military service period of individuals with greater vulnerability or lower stress tolerance. Our findings suggest that individuals with psychotic/schizophrenic spectrum disorder are more vulnerable to stress compared to the other individuals with other diagnosis, since most hospitalizations for psychotic disorders occur during the first two months. To our knowledge, this first study that compared major diagnostic categories regarding psychosocial stressors that may interact with an underlying vulnerability.

A key conclusion of the study is that adaptation stress during military service, favors the onset of psychotic episodes, early during this period. This finding is in agreement with similar studies of the past19–21 reporting an increase in the incidence of first psychotic episodes during the first months of military service period. It is reasonable to assume that the initial adjustment period implies increased stress compared with the period of time that follows (for this reason 53.4% of total hospitalizations occur during the first two months of military service period) and that individuals with the lower stress resilience or lower stress tolerance are more vulnerable to a disorder onset. However, this appears to occur in individuals who experience psychotic spectrum symptoms rather than mood disorders or anxiety disorders. The question arises whether these individuals were ill before military recruitment, so the hospitalization during the first month of military service period may reflect the first detection of the disorder. It is noted that previous studies19,21 have ruled out this possibility demonstrating that the disorder onset occurs during the military service period. Moreover, psychological and psychiatric evaluation of all recruits take place during the recruitment process, and in this way, individuals with an established disorder are excluded from military service through postponement or discharge without hospitalization. However, it cannot be ruled out that individuals with subclinical psychotic symptoms may be undetected during the initial clinical evaluation.
Another important conclusion of the study is that, in line with the diathesis-stress model, individuals with psychotic/schizophrenia spectrum disorder have lower stress threshold than those who develop a mood disorder or anxiety disorder. This finding can be interpreted either in terms of the quantity or qualitative aspects of the stress under which each individual that later develops psychopathology is exposed. As far as the quantitative aspects are concerned, since adapting to the needs of the military service, which is mandatory, is common for all recruits, the focus is more on the individual’s stress tolerance, which seems to be lower in the individuals who subsequently experience psychotic symptoms. It is well known that there is an association between the appearance of psychosis with recent major life events that involve acute stress or daily stress in a demanding environment that cumulatively exceeds the potential counterbalance and the individual’s stress tolerance. Concerning the qualitative aspects of stress, psychosocial stress induces the appearance of psychosis in vulnerable individuals, increases schizotypal features in healthy individuals, while its reduction during the military service period is associated with minimizing the risk for psychotic symptomatology onset. During military service, a conscript may be exposed to stressors that may be considered as a kind of threat for the social self. The recruit has to adapt to a new, demanding environment away from the family and social network safety, potentially experiencing situations that may be perceived as social devaluation, intimidation, isolation, resembling the social defeat hypothesis, increasing the risk for psychotic symptomatology onset.

Besides the nature of psychosocial stress, it was found that other aspects of military service, such as involvement in warfare operations, do not increase the risk for psychosis onset, but for anxiety disorders, especially post-traumatic stress disorder. Anxiety spectrum disorders are triggered by stressors related with life events that cause fear of loss of control and seem to be associated with childhood trauma, particularly emotional abuse and parental rejection. Quality stress factors that predispose to anxiety disorders in young population appear to be more related to fear of loss of health or destabilization in the parental environment (health problems, financial hardship, parental hostility). History of child abuse is considered a risk factor for the appearance of both anxiety disorders and depression for individuals who are exposed to the stressful military environment. The onset of depressive symptomatology is associated with life events related to the loss of an important person or change in life role. Similarly, bipolar disorder is associated with important life events for which stress quality is about achieving life goals or routine interruption but not negative life events. Such life events may trigger manic symptoms in individuals with vulnerability. From the above it can be concluded that both the intensity of the stress factor and the different types of stressors may trigger different vulnerability mechanisms and phenotypic expression. During military service, especially the period of adjustment, intense psychosocial stress in terms of interpersonal interaction may be a more specific mechanism for triggering the vulnerability for psychosis rather than for anxiety or mood disorders.

Acknowledgment of stress-related mechanisms triggering major psychiatric disorders and detection of high-risk populations is a primary objective in terms of prevention and early intervention. Worldwide, over the past 20 years, mental health services have been developed aiming at early recognition and intervention for young people at risk.
of having a mental disorder, especially psychosis."38,39 Similar efforts are systematically organized also in Greece.40,41 The significance of early intervention and development of prevention strategies for vulnerable populations are increasingly gaining ground in the military environment.32 A recent study in the Greek army revealed that the duration of untreated psychosis is minimal for soldiers experiencing a first episode psychosis compared to the average time in the community.21 This may be of particular importance for the later progression and course of the psychotic disorder. The development of prevention strategies and therapeutic interventions in relation to stress management is of high importance for delaying the onset of serious psychiatric disorders. In our study, characteristics such as heritability for psychiatric disorders, substance use, urbanity, did not appear to be related with earlier onset of psychiatric disorders during military service and thus greater vulnerability. However, the sample may be considered relatively small for the evaluation of these effects. In general, social stress management and existence of social support mechanisms, as described in the proposed Diathesis Stress Support model43 which integrates mechanisms for modifying stress and vulnerability factors, are considered to be of particular importance for the protection and early treatment of individuals at risk or with recent onset of clinical symptomatology.

In this study we conducted a comparative analysis of the diathesis-stress model in major psychiatric disorders. It is concluded that the quality and intensity of psychosocial stress may trigger an underlying vulnerability in individuals who experience a psychotic disorder early during the period of military service. According to diathesis-stress model, stress threshold is probably lower in individuals who later develop psychotic symptomatology, comparing to those who experience mood or anxiety disorder. Limitations of the present study were the inclusion of only young males and the relatively small sample for the examination of potential confounding factors. Future studies could provide a deeper understanding of stress mechanisms related to emergence of major psychiatric disorders in order to develop and implement prevention and early intervention strategies for populations in need.

Το μοντέλο διάθεσης-στρες στην ανάδυση μειζόνων ψυχιατρικών διαταραχών κατά τη διάρκεια της στρατιωτικής θητείας

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Ψυχιατρική 2019, 30:291–298

Προοπάρχοντα ευρήματα και το μοντέλο διάθεσης-στρες (diathesis-stress model) δείχνουν ότι το στρες ως περιβαλλοντικός παράγοντας μπορεί να λειτουργήσει πυροδοτικά στην εμφάνιση ψυχιατρικών νόσων, όπως διαταραχές του ψυχωσικού φάσματος, διαταραχές της διάθεσης και ανοιχτές διαταραχές σε άτομα με υποκείμενη ευαλωτότητα. Σκοπός της παρούσας μελέτης ήταν ο προσδιορισμός της χρονικής περιόδου της στρατιωτικής θητείας κατά την οποία συνήθεστερα εκδηλώνεται η οποιαδήποτε κλινικής σπουδαιότητας συμπτωματολογία, θεωρώντας ότι το στρες της θητείας και της προσαρμογής στις απαιτήσεις της είναι κοινό για όλους τους στρατεύσιμους. Σε αναδρομική μελέτη αρχείου για τα έτη 2017–2018 εντοπίστηκαν οι άρρενες στρατιώτες που νοσηλεύτηκαν στην Ψυχιατρική κλινική του 414 ΣΝΕΝ με διαγνώσεις F20–29, F30–39 και F40–F48 κατά ICD-10. Εξετάστηκαν οι αριθμοί των νοσηλειών ανά κλινική διάγνωση και ο χρόνος εμφανί-
σης, όσον αφορά στον μήνα θητείας κάθε νοσηλευόμενου, της αντίστοιχης κλινικής διαταραχής. Εξετάστηκαν συνολικά 139 περιστατικά, τα 118 εκ των οποίων αφορούσαν σε διαταραχές με διαγνώσεις F20–29, F30–39 και F40–F48. Το 53% των νοσηλειών έλαβε χώρα τους πρώτους δύο μήνες θητείας από σύνολο εννέα μηνών. Διαπιστώθηκε ότι ο κίνδυνος νόσησης τους δύο πρώτους μήνες θητείας ήταν στατιστικά σημαντικότερος (OR=0,210, p=0,001), εάν αφορούσε σε διαταραχή του σχιζοφρενικού φάσματος (F20–29) σε σχέση με διαταραχές F30–39 και F40–F48. Μετά από προσαρμογή της ανάλυσης για παράγοντες σύγχυσης, όπως η κληρονομικότητα για ψυχιατρική νόσο, η αστικότητα, το ιστορικό χρήσης ουσιών ή η ηλικία νόσησης, ο κίνδυνος νοσηλείας τούς δύο πρώτους μήνες συνέχισε να προβλέπεται κατά στατιστικά σημαντικό τρόπο από νόσηση με διαταραχή F20–29 (OR=0,255, p=0,022) σε σύγκριση με άλλες διαγνώσεις. Τα άτομα με προδιάθεση για ανάπτυξη ψυχωσικής διαταραχής φαίνεται ότι έχουν χαμηλότερο ουδό ανοχής στο στρες και ενδεχομένως νοσούν νωρίτερα κατά τη διάρκεια της θητείας σε σύγκριση με άτομα με προδιάθεση διαταραχών διάθεσης ή αγχωδών διαταραχών. Το στρες κατά τη διάρκεια της θητείας είναι μείζονος σπουδαιότητας για την εμφάνιση όλου του φάσματος της ψυχοπαθολογίας, ιδιαίτερα σε ευάλωτα άτομα. Η ανάπτυξη στρατηγικών πρόληψης και έγκαιρης παρέμβασης κρίνεται ως ιδιαίτερης σημασίας για τους στρατεύσιμους. Τα ευρήματα της παρούσας μελέτης συμφωνούν με το μοντέλο στρες-διάθεσης και επιπρόσθετα υποδεικνύουν ότι τα άτομα που μετέπειτα αναπτύσσουν διαταραχή ψυχωσικού φάσματος, έχουν μεγαλύτερη ευαλωτότητα στην επίδραση του στρες.

Λέξεις ευρετηρίου: Μοντέλο διάθεσης-στρες, πρώτο ψυχωσικό επεισόδιο, ψυχοκοινωνικό στρες, έγκαιρη παρέμβαση.

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