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ORIGINAL ARTICLE

Personality dimensions could explain resilience in patients with eating disorders

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Abstract

Purpose Resilience can be defined as the ability to maintain health in the face of adversity. Resilience has been associated with personality traits. Personality traits in the context of Eating Disorders (ED) have also been examined. However, the relationship between resilience and personality profile in patients with ED has not been studied. The aim of this study is to investigate whether personality dimensions impact on resilience, in patients with ED, compared to healthy participants.

Methods Connor and Davidson resilience scale, as a measure of resilience and temperament—character inventory, as a measure of personality dimensions, were completed by 100 participants: 50 (50%) healthy University students (controls subgroup) and 50 (50%) patients with ED, matched on age and gender.

Results Patients with ED showed lower resilience than healthy participants and scored higher on harm avoidance, and lower on reward dependence, self-directedness and cooperativeness than controls. Lower harm avoidance, higher persistence and higher self-directedness were associated with resilience in both subgroups. Self-directedness and persistence predicted resilience in both subgroups. Only Harm Avoidance predicted resilience in patients' subgroup.

Conclusion To our knowledge, there are no existing data examining the effect of personality dimensions in resilience, in the context of ED. We found that only the effect of Harm Avoidance in resilience was different among the participants' subgroups. In conclusion, Harm Avoidance could explain differences in resilience between healthy participants and patients with ED.

Level of evidence Level III: case–control analytic study.

Keywords Resilience · Personality · Eating disorders · Harm avoidance · Temperament

Introduction

Resilience can be defined as the person's ability to respond to stressful events, remaining stable and maintaining satisfactory functionality [1]. It is a complex concept which is mostly considered as a dynamic, developmental process through which individuals acquire the ability to overcome adversity [2]. Biological [3–7], social [8–11] and psychological [12–14], dimensions are involved in this process. The relation between resilience and personality is often presented as unclear. Resilience in many cases has been associated with personality traits, stable over time [15–18]. Personality, in other cases, is thought to be as one of many resilience factors that might contribute to a person's adjustment following traumatic events [19–21]. Resilience nowadays is described as a dynamic adaptation process, rather than a stable trait, although it is thought to be related to stable personality characteristics [2, 21].

Recently, the study of resilience has shifted to the investigation of isolated traumatic life events in adults [22]. However, preclinical and clinical studies suggest that early life stress is associated with the development of depressive and anxiety disorders in adulthood [23–25], as well as with the presence of personality disorders [26] and Eating Disorders

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(ED) [27, 28]. It remains remarkable that most people do not develop psychiatric disorders despite their exposure to early life or current stressors [21, 29, 30]. There are studies supporting that the incidence of mental disorders does not depend on childhood trauma, but on resilience levels [15]. According to this point of view, resilience is proposed to be a mediator for the depressive and anxiety symptomatology [15, 31, 32]. As a consequence, we could assume that resilience could also be a mediator for the development of ED symptomatology. Considering the above, early life stress could explain a predisposition to the development of ED and potential current traumas might explain the onset of ED symptomatology. In this context, resilience in the field of ED could be considered as the dynamic process to overcome stressors (predisposing or triggering factors) in order to remain healthy or develop mechanisms to protect against ED symptomatology.

Non-specific risk factors [33, 34] as well as specific risk factors, to the onset of ED, as low self-esteem [35, 36] and maladaptive perfectionism [37] are well established. However, few data exist for the specific psychological factors protecting against ED symptomatology. The study of resilience in the field of ED could lighten this gap in the literature. Since personality is considered as one of the resilience factors, the study of resilience in the context of personality in ED seems appropriate. Personality dimensions in the field of ED have been previously described and connected to the severity of the symptomatology [38]. However, no evidence exists concerning the personality influence to recovery [39]. Based on such observations the question of whether personality traits affect the therapeutic outcome remains unanswered [39, 40]. Since resilience is considered as a dynamic process to overcome stressors and remain healthy, resilience could be thought of as a marker of recovery. In conclusion, the impact of personality dimensions on resilience could partially answer the question about the impact of personality dimensions on therapeutic outcomes in ED.

Cloninger's personality theory provides a psychobiological model of the structure and development of personality. In the context of this theory, genetic and neurobiological mechanisms are involved in the development of personality. Personality within this framework is described as a multidimensional adaptive system, involving interactions between temperament (the emotional and heritable core of the personality) and character (the conceptual core). More specifically, temperament refers to individual differences in habit and skills that are supposed to be moderated by the limbic system and accounts for four distinct traits, which are considered as heritable and more stable. Character, on the other hand, represents individual differences in goals and values and it is associated with the cognitive system. It reflects more conscious, self-aware concepts about the self, the society, and the universe. Both temperament and character dimensions are integrated into the concept of personality to express different aspects of people's adaptation to the environmental changes [41]. The multidimensional nature of the concept of resilience, as well as the dynamic consideration of the term, as described above, favors a better understanding of Cloninger's personality theory. This is more obvious if we consider personality as an adaptation system, involving dimensions of temperament and character and resilience as individual differences in people's response to stress, that may relate to such dimensions of personality. The impact of Cloninger's dimensions on resilience has been previously reported [42, 43] and gives us a theoretical background to focus on. Therefore, the main aim of this study was to investigate whether personality dimensions, according to Cloninger's model, impact on resilience, in patients with ED, compared to healthy participants.

Based on the above, our first hypothesis was that patients with ED would be less resilient than healthy controls (HC). Our second hypothesis was to confirm that ED participants in our sample correspond to the well-known personality profile of the literature. Our third hypothesis was that personality dimensions could predict resilience. Our fourth hypothesis was that the impact of personality dimensions on resilience might be different between ED and HC.

Methods

Participants

Fifty patients with ED (45 women and 5 men) and 50 age- and sex-matched HC were included in the study. The diagnosis of ED was based on the Diagnostic Statistical Manual 5 (*DSM-5*) [44]. A clinical evaluation of all participants was performed by an experienced psychiatrist. Patients were consecutively enrolled in the study from Eating Disorders' Unit, 2nd Department of Psychiatry, at Attikon University Hospital. The sample consists of 39 patients with Anorexia Nervosa (AN) and 11 patients with Bulimia Nervosa (BN). The subgroup of AN consists of 30 patients with a restrictive subtype of AN (ANR) and 9 with purging subtype of AN (ANP). No clinical comorbidities were found. Normal-weight university students were included as HC. They had no history of ED or other psychiatric disorder. The demographic data of all participants (age, gender, education, marital status, living alone or with others, employment status) are shown in Table 1.

To assess Body Mass Index (BMI), which is defined as weight in kilograms divided by height^2 in meters, weight, and height of all cases were measured using calibrated instruments. The measurements in all cases were performed by educated nurses of the ED Department at 08:00 am before breakfast.

Table 1 Demographic data of participants

	Controls ($n=50$)	Patients with ED ($n=50$)	T test (P value)	Effect size (Cohen's d)
Age, mean (Sd)	27.9 (8.5)	28 (8.6)	− 0.116 (0.908)	− 0.01
Education (years), mean (Sd)	15.5 (2.2)	14.1 (1.7)	3.665 (< 0.001)	0.71
BMI, mean (Sd)	21.5 (1.9)	16.9 (3.9)	− 5.554 (< 0.001)	1.5
Women, N (%)	45 (90%)	45 (90%)	$0.000^{\neq}$ (1.000)	
Living alone, N (%)	6 (12%)	10 (20%)	$1.190^{\neq}$ (0.275)	
Married, N (%)	14 (28%)	6 (12%)	$4.000^{\neq}$ (0.046)	
Employed, N (%)	45 (90%)	28 (56%)	$14.66^{\neq}$ (< 0.001)	

$^{\neq}$Pearson x^2

Sd standard deviation

Materials

1. The Structured Clinical Interview for DSM-5 (SCID-5) was used for diagnostic assessment of participants [45].
2. Connor and Davidson resilience scale (CDRISC25), was used as a measure of resilience. It is a short, self-rated, 25 items scale, scoring from 0 to 4 on a Likert scale [46]. The scale has been translated and validated in Greek, showing adequate psychometric properties (Cronbach's $a=0.919$) [47].
3. Temperament and Character Inventory (TCI-140) is a personality inventory measuring 4 dimensions of temperament and 3 character dimensions, in 7 separate subscales [48] and was used as a measure of personality dimensions. Temperament subscales are: harm avoidance (HA), novelty seeking (NS), reward dependence (RD) and persistence (P). Character subscales are: self-directedness (SD), cooperativeness (CO), self-transcendence (ST) [41]. It has been translated and validated in Greek, showing adequate psychometric properties and retaining the initial factorial structure [49]. Cronbach's a reliability for TCI dimensions ranged from 0.653 to 0.873 (NS 0.653, HA 0.842, RD 0.656, P 0.871, SD 0.873, CO 0.733, ST 0.821).

Statistical analysis

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) 25 and STATA 13. Prior to data analysis, data were examined to ensure that the assumptions of parametric testing were met.

The two groups (HC vs ED) were compared on demographic variables, BMI, resilience and personality dimensions. Pearson Chi-square (X2), t-test and effect sizes were estimated, as appropriate, to test statistical differences and their importance.

In order to verify that each subsample of patients did not differ significantly from the others concerning the measures applied in the present research (CDRISC25, TCI), Kruskal Wallis H and Mann–Whitney U tests were used respectively among subgroups of patients with ED (ANR, ANP, BN), (AN vs BN) as well as across genders (men, women).

Correlations between resilience and continuous variables (age, BMI, years of study) were estimated using Pearson's r. Correlations between resilience and personality dimensions in HC and in ED subgroups were estimated using Pearson's r correlation test. Correlations were defined as strong ($r>0.5$), moderate ($0.3>r>0.5$) or weak ($r<0.3$). Correlation coefficients were compared with Fisher's z across groups [50].

Stepwise linear regression analysis was performed in the total sample to test the main effects of group and TCI dimensions on resilience. Interaction of group and the TCI dimensions derived from the main effects analysis were examined in additional regression models, to further examine if the impact of personality dimensions on resilience depended on the group (HC vs ED). The contribution of significant interaction terms to the variance explained by the final model was calculated in a hierarchical regression analysis. Simple slope tests were also performed when interaction was significant.

Our study had a power of 0.97 to detect an interaction effect of at least a medium effect size ($f^2=0.15$). The minimum effect size of the interaction effect to be detected with a power of 0.80 was $f^2=0.08$ (small).

Results

No differences in resilience and all TCI dimensions were revealed between men and women in ED patients, between AN and BN, as well as among ANR, ANP, BN subgroups.

No statistical differences in terms of age, gender, marital status, and living alone or with others were found between HC and ED patients. Most patients were unemployed and had lower education, in comparison to healthy participants ($p<0.001$, effect size = 0.71). Differences in BMI between

patients and controls were recorded, as expected ($p < 0.001$, effect size = 1.50) (Table1).

There were significant differences in resilience between controls and patients ($p < 0.001$, effect size = 1.60). Patients with ED were more harm avoidant ($p < 0.001$, effect size = 1.12), less reward dependent ($p = 0.002$, effect size = 0.64), less persistent ($p = 0.019$, effect size = 0.48), less self-directed ($p < 0.001$, effect size = 1.32) and less cooperative ($p = 0.004$, effect size = 0.60) than HC. However, the difference in persistence was not statistically significant after bonferroni correction (p-value cut off = 0.007). No differences in NS ($p = 0.655$) and ST ($p = 0.264$) were found (Table 2).

BMI and age, showed no correlation to resilience in the total group ($r = 0.087$, $p = 0.558$ and $r = 0.024$ $p = 0.813$, respectively). Education (years) showed a weak positive correlation (0.234, $p = 0.019$) with resilience.

HA showed a strong negative correlation with resilience in patients ($p < 0.001$) and a moderate negative correlation in controls ($p = 0.005$). P showed a strong positive correlation with resilience in patients ($p < 0.001$) and a moderate positive correlation in controls ($p = 0.037$). SD showed a strong positive correlation in both subgroups ($p < 0.001$). ST and CO showed no significant correlation in both subgroups. NS and RD showed a significant correlation with resilience only in controls ($p = 0.033$ and $p = 0.024$, respectively). Only correlations between NS and resilience showed significant differences across groups (Fisher's $z = 2.263$, $p = 0.02$) (Table 3).

The stepwise linear regression analysis in the total sample, with the total score of CDRISC25 as dependent and all TCI dimensions and group (HC vs ED) as independent variables, led to a statistically significant model explaining 64.5% of the variance (Adjusted R Squared = 0.645) keeping as significant predictors HA, P, SD and group (Table 4).

Interactions between group and HA, P, and SD were examined in a new regression model. Only the interaction between HA and the group was statistically significant. Therefore, we ran a final regression model with P, SD, HA, group and HA by group interaction as predictors. The model was statistically significant, explaining 65.7% of the variance (adjusted R square = 0.657). This model shows that only HA has a different impact on resilience across groups while the impact of P and SD on resilience was similar for both groups (Table 5). The interaction of group by HA was significant ($p = 0.040$) and significantly contributed to the

Table 2 Differences in resilience and TCI dimensions between groups (*t*-tests)

	Mean (Sd)		*t* test (*p* value)	Effect size (Cohen's *d*)
	Controls	Patients with ED		
CDRISC25	70.88 (10.52)	49.82 (15.32)	8.014 (< 0.001)	1.60
Novelty seeking	57.94 (10.25)	58.84 (9.84)	− 0.448 (0.655)	− 0.09
Harm avoidance	55.76 (13.12)	69.56 (11.55)	− 5.583 (< 0.001)	− 1.12
Reward dependence	70.90 (8.63)	65.20 (9.21)	3.193 (0.002)	0.64
Persistence	70.97 (12.61)	64.88 (12.93)	2.384 (0.019)	0.48
Self-directedness	75.84 (12.99)	58.16 (13.78)	6.599 (< 0.001)	1.32
Cooperativeness	79.54 (9.82)	72.64 (13.20)	2.965 (0.004)	0.60
Self-trancedence	40.66 (11.27)	43.28 (12.02)	− 1.124 (0.264)	− 0.22

Bonferroni cut-off $p = 0.007$

Sd standard deviation

Table 3 Pearson *r* correlations between TCI dimensions and resilience score in HC and ED and differences of correlation coefficients between the groups

	Controls *r* (*P* value)	Patients with ED *r* (*P* value)	Fisher's *z* (*P* value)
Novelty seeking	0.301* (0.033)	− 0.155 (0.281)	2.263* (0.02)
Harm avoidance	− 0.394** (0.005)	− 0.611** (< 0.001)	1.425 (0.15)
Reward dependence	0.319* (0.024)	0.041 (0.779)	1.404 (0.16)
Persistence	0.295* (0.037)	0.499** (< 0.001)	− 1.182 (0.23)
Self-directedness	0.550** (< 0.001)	0.500** (< 0.001)	0.335 (0.74)
Cooperativeness	0.084 (0.562)	0.248 (0.082)	− 0.820 (0.41)
Self-transcendence	0.171 (0.234)	0.179 (0.214)	− 0.040 (0.97)

*$p < 0.05$ level

**$p < 0.01$ level

variance explained by the final model (R^2 change = 0.015, $p = 0.040$), as calculated in a hierarchical regression analysis.

Finally, simple slope tests were examined for the HA by group significant interaction. The simple slopes were $b = -0.184$, SE = 0.111 (t-value = − 1.66, $p = 0.1$) in HC and $b = -0.529$, SE = 0.133 (t-value = − 3.96, $p < 0.001$) in ED, indicating that HA has a stronger negative effect on resilience in patients than in healthy controls. An interaction plot (margins plot by the group) is presented in Fig. 1a. Marginal contrasts of resilience for the group are depicted in Fig. 1b, allowing the identification of the region of significance, i.e. the range of HA values (HA ≥ 54) in which the HA by group interaction is significant (Fig. 1).

Discussion

Subgroups of patients (AN vs BN), (ANR vs ANP vs BN) and (men vs women) showed no differences in terms of resilience as well as in terms of TCI dimensions, allowing us to include all cases and to proceed to comparisons between ED and HC. Lower levels of resilience were recorded in patients with ED compared to HC, confirming our first hypothesis. HC and ED patients differed significantly in all TCI dimensions, except for NS and ST, which is consistent with our second hypothesis. Considering TCI dimensions P, and SD were able to predict resilience in both subgroups. Only the effect of HA on resilience was different across groups (HC

Table 4 Prediction of resilience by TCI dimensions in the total sample (stepwise regression)

	Unstandardized coefficients		Standardized coefficients	*t*	*P* value
	B	Std. error	Beta		
Self-directedness	0.339	0.082	0.323	4.125	< 0.001
Harm avoidance	− 0.321	0.090	− 0.270	− 3.560	0.001
Group (1 = patients with ED)	− 9.001	2.504	− 0.269	− 3.595	0.001
Persistence	0.267	0.083	0.208	3.229	0.002

Table 5 Differential association of harm avoidance with resilience between healthy controls and patients with ED

	Unstandardized coefficients		Standardized coefficients	*t*	*P* value
	B	Std. Error	Beta		
Group (1 = patients with ED)	12.740	10.733	0.381	1.187	0.238
Harm avoidance	− 0.184	0.111	− 0.154	− 1.660	0.100
HAxgroup	− 0.345	0.166	− 0.737	− 2.081	0.040
Self-directedness	0.329	0.081	0.313	4.059	< 0.001
Persistence	0.235	0.083	0.182	2.830	0.006

HAxgroup interaction between Harm Avoidance and group

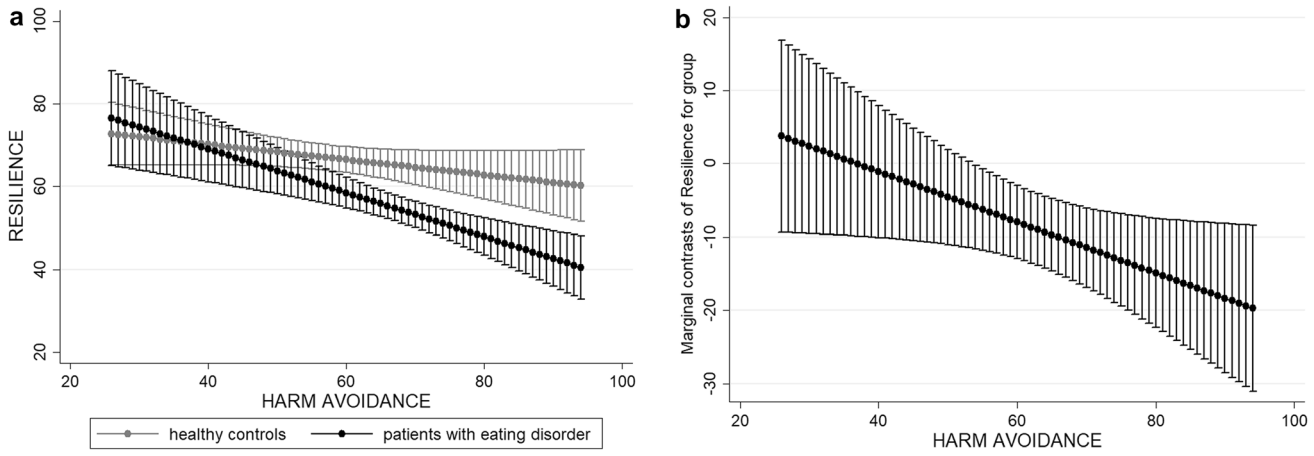

Fig. 1 **a** Group by Harm Avoidance interaction plot, **b** marginal contrasts of resilience for groups

vs ED). These findings confirm both our third and fourth hypotheses.

We found lower resilience in patients with ED and this is in accordance with previous findings. Lower resilience was previously reported in patients with ED compared to the general population and recovered patients. No difference in resilience was observed between recovered patients and general population [51]. A systematic review proposed resilience as a fundamental criterion for ED recovery, in addition to existing criteria [52]. A qualitative study, concluded in a resilience model explaining the process from illness to recovery, in patients with ED [53].

No remarkable differences in TCI dimensions among different diagnostic categories of ED were found, which is in accordance with previous findings. In general, high HA, low SD and low CO seem to be common in all ED types [38].

Men with AN scored lower than women in HA, RD, and SD in a previous study [54]. Compared to women with AN, men scored lower on HA, RD, CO, and ST but higher on NS [55]. We found no remarkable differences in personality profile between men and women, but that could not be generalized, due to our very small number of men in our sample.

Differences in personality between HC and ED were also reported by previous studies. The relation between resilience and TCI dimensions has been studied previously. Overall, high P, high SD as well as low HA are found to contribute to better stress response [43]. We found a more "resilient" personality profile (low HA, high P, high SD) in our controls subgroup, and a less 'resilient' personality profile (high HA, low P, low SD) in patients with ED, which is in accordance with previous findings. Three clusters of personality subtypes were found in men with ED with respect to clinical characteristics: the maladaptive, the social detached, and the adaptive –like. However, no evidence exists concerning the personality influence to recovery [39]. Consequently, the question whether personality traits affect therapeutic outcome remains unanswered [39, 40].

We found that P could predict resilience in HC and ED. P is a temperament trait explaining individual differences in response to ambition. It refers to the perseverance despite frustration or fatigue [48]. P has been associated with resilience but also with perfectionism and compulsiveness [56]. People who are highly persistent tend to have anxiety disorders rather than depression [56]. Resilience was found to have a strong to moderate positive relation with P [42, 43]. Our finding could be explained if we consider that P incorporates the notions of maladaptive perfectionism and compulsiveness, which are common characteristics in patients with ED, related with poor prognosis [37].

We also found that SD predicted resilience in HC and in ED. Previous observations may explain our finding. More precisely, SD refers to an individual's capacity to adapt in changes, being in accordance with the personal goals and values [48]. Self-confidence and self-control, which obviously reflect SD, have been considered as resilience components [25]. Moreover, low self-confidence has been associated with the onset and the perseverance of ED symptomatology [34]. In addition, resilience was found to have a strong with moderate positive relation with SD [42, 43]. Finally, patients with ED have poor cognitive flexibility. Cognitive flexibility, also reflecting SD, has been described as a possible factor of poor prognosis in ED [57].

Finally, we found that HA predicted resilience only in ED. HA is a temperament trait explain individual differences in the response to fear and has been associated with pessimistic worry, passive, avoidant behaviors, the fear of uncertainty [48]. A clear negative relation between HA and resilience has so far been reported in the literature [42, 58, 59]. Furthermore, HA is associated with avoiding behaviors and anxiety symptoms. Food avoidance, which reflects the fear of gaining weight, is a core characteristic in ED. Moreover, the avoidance of potentially risky or harmful situations is often described in patients with ED. These symptoms reflect the core symptomatology in ED if we consider that ED (especially AN), are thought to be a maladaptive way of a person to avoid the stress of maturity and the responsibilities of adulthood [60]. Considering the above, our finding indicates the negative impact of behavioral inhibition on the development and maintenance of ED symptomatology [55].

In conclusion, to our knowledge, this is the first study investigating the influence of TCI dimensions in resilience in patients with ED. As resilience could provide a framework for understanding recovery [52, 53], this study could partially answer the question if personality traits may explain the therapeutic outcome in ED. Consequently, we could consider that high HA in patients with ED, might partially explain, along with other features, difficulties of these patients to be engaged in the therapeutic procedures that could result in a poor therapeutic outcome, but this assumption would need more evidence to be based, so future attempts could focus on this direction. Resilience in the field of ED needs further examination. Clinical implications, as promoting resilience, focusing on avoidant behaviors or preventing dropouts, could be favored by an in-depth study of resilience in ED. Future studies should focus on clinical and eating symptoms since clinical conditions (depression, anxiety) could be related to patients' resilience and also to personality traits. Future studies should also focus on psychobiological mechanisms involved in resilience in ED aiming at integrating the concept of resilience in ED treatment models.

Limitations

Relatively small recruited sample and small subgroups within ED diagnosis.

Differences in factorial structure of CDRISC25 and TCI-140 between the two subgroups might exist. However, measurement invariance is not possible to be examined due to small sample sizes.

The use of self-rated questionnaires has some limitations. However, no other measures exist to examine resilience, temperament, and character dimensions. We believe that the validity scale incorporated in TCI may partially overcome the problem of invalid answers and the Likert response scale, of both scales, partially overcomes the response bias. Future research attempts should focus on improved research paradigms, such as biomarkers indicating endophenotype.

What is already known on this subject?

Although the study of resilience has grown, resilience in the field of eating disorders has not been studied adequately, so far.

What our study adds?

To our knowledge, this is the first study examining the link between personality dimensions and resilience in ED.

Compliance with ethical standards

Conflict of interest All authors declare that there is no conflict of interest that might have influenced the results of the study described on the manuscript and that they received no funding.

Ethical approval The study was approved by the Scientific Council and the Ethics Committee of the "Attikon" University General Hospital.

Informed consent All participants signed written informed consent.

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