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FATIGUE AND THE PSYCHOLOGICAL CHARACTERISTICS OF MEDICAL STUDENTS

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Abstract
Objectives: The present study examined the relationship between medical student fatigue with psychological variables: emotional intelligence (EI), sense of coherence (SoC) (comprehensibility, manageability, and meaningfulness), quality of life (QoL), stress, and satisfaction with studying medicine. **Material and Methods:** The sample consisted of 566 medical students from the Medical University of Gdańsk, Poland. The instruments used were the *Chalder Fatigue Scale*, *Schutte Self Report Emotional Intelligence Test*, *Sense of Coherence Questionnaire*, and a questionnaire designed by the authors, comprised questions relating to the quality of life, stress levels, and satisfaction with studying medicine. **Results:** The results show that fatigue was negatively related to the ability to use emotions effectively in the management of one's activities (EI), 1 aspect of SoC – a level of comprehensibility, QoL, and satisfaction with studying medicine. Fatigue is positively related to the ability to recognize, understand, and control emotions (EI) and stress connected with studying medicine. **Conclusions:** The outcomes of the study afford a better understanding of the relationship between selected variables in the field of individual differences in the context of fatigue in the medical student population. It may help medical educators and authorities to have a better understanding of the phenomenon of building resilience and increasing abilities to cope with the negative effects of chronic stress such as fatigue in the population of medical students. Early recognition of specific psychological features in medical students, such as misunderstanding emotions and their perception of environments as unstructured, would make it possible to prepare early support and development programmes. Int J Occup Med Environ Health. 2023;36(4):517–25

Key words:
fatigue, quality of life, emotional intelligence, medical students, sense of coherence, medical education

INTRODUCTION

As a result of COVID-19, medical schools and universities around the world are seeking creative ways to help medical students become more resilient and improve their ability to cope with the negative effects of chronic stress, such as fatigue. Fatigue can be defined as a feeling of lack of energy and difficulty in the initiation or maintenance of spontaneous activities [1]. In addition, increasing amounts of data indicate that fatigue is a growing problem among medical students [2,3]. At the most basic level, fatigue may be associated with an increased risk of medical errors [4]. A common reason for fatigue in medical students may simply be an excessive academic workload, which contributes to poor empathy [5]. In this group, stress and avoidance-orientated coping styles are associated with high levels of fatigue [6] and low levels of self-directedness [2].

When considering the psychological functioning of medical students, it is worthwhile to mention another phenomenon – emotional intelligence (EI). This term refers to

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the verbal and non-verbal appraisal of emotion, the regulation of one's and other's emotions, and the use of emotional content in problem-solving [7]. Medical schools are trying to find ways to develop students' skills of empathetic interest in the feelings of others to improve their communication with patients and colleagues [8]. Studies suggest a negative association between EI and fatigue in medical [9] and psychology students [10]. Emotional intelligence is also associated with academic performance [11], clinical decision-making [12], well-being [13], and perceived stress [14]. This is important in medical education, as physicians must respond appropriately to multiple emotional experiences each working day [15–17]. Furthermore, EI is directly related to patient satisfaction with medical care [18,19]. What is significant, EI might be more important than the learning environment in improving medical students' critical thinking [20].

Another phenomenon related to the psychological functioning of medical students is the sense of coherence (SoC). The SoC is a global orientation that includes 3 elements:

- comprehensibility – the stimuli emerging from a person's internal and external environments are structured, predictable and explicable;
- manageability – resources are available to meet the demands of these stimuli;
- meaningfulness – these requirements are a challenge worthy of the necessary investment and effort [21].

The relationship between SoC and health, quality of life, and perceived stress has been investigated in several studies [22,23]. A strong SoC implies the successful management of stressors in order to maintain and improve an individual's well-being [24]. There is an association between fatigue, SoC, quality of life (QoL), and stress in the patient population [25,26]. The SoC has been validated as a predictor of success in the health care profession [27] and has also been validated as a possible determinant predicting reduced exhaustion and depersonalization as well as high levels of professional performance. The SoC aspect – meaningfulness – has been demonstrated to have the highest predictive value for professional burnout [28]. In addition, SoC serves as an important resilience factoras it can buffer the adverse effect of social restrictions on mental health [29].

Aim of the present study

To the best of authors' knowledge, the relationship between fatigue, EI, and SoC amongst medical students has yet to be explored, so the authors endeavoured to do so. In the presented study, the relationship between fatigue and quality of life, stress connected with medical studies, and satisfaction with studying medicine were also examined. The authors expect the analysis of those variables will provide a better understanding of the phenomenon of building resilience and increasing abilities to cope with the negative effects of chronic stress such as fatigue in the population of medical students. The authors hypothesised that students with a higher level of EI and SoC would experience lower levels of fatigue, which would, in turn, be negatively related to QoL and satisfaction with studying medicine and negatively to stress.

MATERIAL AND METHODS

Participants

In 2018 and 2019, a total of 600 second-year medical students at the Medical University of Gdańsk, Poland, received an anonymous questionnaire after classes on psychology in medicine. The response rate was 94% (N = 566, 60% female). Participation in the study was voluntary, for which the students gave their written consent. They did not receive payment or extra credits and could withdraw at any time.

Measures

The *Chalder Fatigue Scale* (CFS) is the 11-item scale. It reflects a multidimensional view of fatigue defined as: fatigabil-

ity, decreased physical and mental endurance, memory and thinking problems [30]. Questions are on a 4-step scale. Answers to the first 7 items show the degree of physical fatigue, and the next 4 items – mental fatigue. The overall score is obtained by adding up all the items. There are 2 scoring methods:

- a Likert system, the subject's responses are rated as 0, 1, 2 or 3 pts, with a maximum of 33 pts;
- a bimodal method, the severity of responses is ignored, and they are classified as "problematic" ("more than usual" or "much more than usual" – 1 pt) or "no problematic" ("less than usual" or "no more than usual" – 0 pt), with a maximum of 11 pts. The survey procedure is concise and takes about 3–5 min. The questionnaire is a type of self-report measure and has satisfactory psychometric properties [31].

The Polish version of the *Schutte Self Report Emotional Intelligence Test* (SSEIT) is a method of measuring general EI using 2 subscales:

- the ability to recognise, understand, and control emotions (either one's own or those of others);
- the ability to use one's emotions effectively in the management of one's activities or those of others [32,33].

The first dimension consists of items 5, 9, 15, 18, 19, 22, 25, 26, 29, 30, 32, and 33. The minimum score to obtain is 12 pts, the maximum – 60 pts. The second dimension consists of items 2, 3, 6, 7, 9, 10, 12, 13, 14, 17, 20, 22, 23, 27, 30, and 31. For each, respondents receive a score equal to the number of marks they marked (direct scoring). The minimum score to obtain is 16 pts, the maximum – 80 pts. Three items are in both categories and 8 items are not in either, so the total score is not the sum of partial scores. The questionnaire has satisfactory psychometric properties [33].

The *Sense of Coherence Questionnaire* (SoC-29) measures a "global orientation, which expresses the extent to which one has a pervasive, enduring, and dynamic sense of confidence." It is based on Antonovsky's concept of salutogenesis – a concept that describes whether or to what extent people perceive their environment and life circumstances as understandable, manageable and meaningful. This is 29-item self-assessment tool. Higher scores should be associated with higher SoC values. [21].

The participants completed a questionnaire designed by the present study's authors where the level of stress and satisfaction experienced when studying at the Faculty of Medicine was assessed. The participant also assessed current life and rate of life over the past 2 weeks.

RESULTS

The sociodemographic characteristics are in Table 1. Sixty-one percent were female. The participants lived in different places during their studies (i.e., the family home, dormitories, rented rooms or flats, or owned apartments). Half of the participants have families connected with medicine. The average level of satisfaction connected with the participants' medical studies ranged

Table 1. Sociodemographic and study-related characteristics of participants (second-year medical students), 2018–2019, Medical University of Gdańsk, Poland

Variable	Participants (N = 566)
Gender [n (%)]	
female	342 (61)
male	224 (39)
Place of current residence [n (%)]	
family home	151 (27)
dormitory	51 (9)
renting a room	131 (23)
renting a flat	221 (40)
owned apartment	2 (0.3)
Family connected with medicine [n (%)]	
yes	284 (51)
no	276 (49)
Stress connected with medical studies (M±SD) [pts]	7.12±2.13
Satisfaction with studying medicine (M±SD) [pts]	6.60±2.15

Table 2. Regression model of general fatigue and psychological variables ($R^2 = 0.28$) in second-year medical students, 2018–2019, Medical University of Gdańsk, Poland

Coefficient	Estimate β	p
Sense of coherence		
comprehensibility	–0.12	0.002
Emotional intelligence		
recognising emotions	0.08	0.04
using emotions	–0.13	0.005
Satisfaction connected with studying medicine	–0.18	0.0005
Stress connected with medical studies	0.31	0.000
Quality of life	–0.10	0.02

from 1 ("no satisfaction") to 10 ("very high satisfaction") was 7.12. The average level of the subjectively estimated level of stress connected with medical studies ranged from 1 ("lack of stress") to 10 ("very high stress") was 6.60.

There was no statistically significant difference in general fatigue levels between the male (M±SD 26.88±5.86) and female (M±SD 27.17±5.98) participants (t-test: t(df) = 0.58, p = 0.73). The type of accommodation had no significant effect on the level of fatigue (ANOVA F(4, 557) = 0.04, p = 0.99).

In the regression model presented in Table 2, comprehensibility (SoC), EI in both aspects recognising and using emotions, QoL, satisfaction with studying medicine, and stress connected with medical studies proved to be predictors of student fatigue. The model was statistically significant with $R^2 = 0.28$. this explained approx. 28% of the variance for fatigue. Comprehensibility (SoC), EI, and QoL were significant predictors of fatigue. A low level of comprehensibility (SoC), using emotions (EI), and a high level of recognising emotions (EI) significantly predicted fatigue, while QoL, satisfaction, and stress also contributed significantly to the model.

Table 3 shows the correlations between levels of fatigue (CFS and specific questions from the SSEIT. Fatigue negatively correlated with questions on the recognising emotions sub-scale of EI: 15, 19, 22, 33. Fatigue also negatively correlated with questions on the using the emotions sub-scale of EI: 2, 3, 10, 12, 13, 14, 17, 20, 22, 23, 27, 31.

DISCUSSION

The present study aimed to analyse the relationships between medical students' fatigue with EI, SoC, QoL, stress connected with medical studies; and satisfaction with studying. There have been no studies taking into consideration these dimensions altogether. In addition, it seems that this topic is rarely explored in this way among medical profession. The authors hypothesised that students with a higher level of EI and SoC would experience lower levels of fatigue. It was also expected that fatigue would be positively related to stress and negatively related to satisfaction with studying medicine and QoL.

Some of the results confirmed the authors' hypothesis and the more predictable assumptions while others were rather unexpected. The authors intuited, based on the available research results presented in the introduction, that higher fatigue would be associated with a lower level of satisfaction with medical studies, QoL, and a higher level of stress. However, the results regarding EI and SoC were thought-provoking. Figure 1 presents the simplified, main results of the research.

Fatigue was positively associated with the ability to recognise, understand, and control emotions (EI) – this was surprising. Paradoxically, students with a good understanding of their own emotions might at the same time be more competent at recognising various aspects of the realities of studying medicine. Hypothetically, interpreting the results obtained, they were able to admit that they were overloaded. They may therefore have been more prepared for what lay ahead of them.

Secondly, there was a negative correlation between fatigue and the ability to use one's emotions effectively in the management of one's activities or the activities

Table 3. Relations between individual items of *Schutte Self Report Emotional Intelligence Test* (SSEIT) and *Chalder Fatigue Scale* (CFS) results in second-year medical students, 2018–2019, Medical University of Gdańsk, Poland

Individual items of emotional intelligence (SSEIT) and fatigue (CFS)	M	SD	R
Recognising emotions (EI)			
5. "I find it hard to understand the non-verbal messages of other people"	2.25	1.03	0.0351
9. "I am aware of my emotions as I experience them"	3.77	0.88	–0.076
15. "I am aware of the non-verbal messages I send to others"	3.48	0.94	–0.084*[a]
18. "By looking at their facial expressions, I recognise the emotions people are experiencing"	4.03	0.81	–0.000
19. "I know why my emotions change"	3.68	1.06	–0.140*[a]
22. "I easily recognise my emotions as I experience them"	3.78	0.94	–0.182*[a]
25. "I am aware of the non-verbal messages other people send"	3.77	0.90	0.014
26. "When another person tells me about an important event in his or her life, I almost feel as though I have experienced this event myself"	3.05	1.17	0.004
29. "I know what other people are feeling just by looking at them"	3.37	0.98	0.023
30. "I help other people feel better when they are down"	4.06	0.81	0.003
32. "I can tell how people are feeling by listening to the tone of their voice"	3.76	0.87	0.022
33. "It is difficult for me to understand why people feel the way they do"	2.09	0.98	0.091*[a]
Using emotions (EI)			
2. "When I am faced with obstacles, I remember times I faced similar obstacles and overcame them"	3.95	0.99	–0.179*[a]
3. "I expect that I will do well on most things I try"	4.00	0.91	–0.261*[b]
6. "Some of the major events of my life have led me to re-evaluate what is important and not important"	4.05	0.94	–0.009
7. "When my mood changes, I see new possibilities"	3.64	1.01	–0.060
9. "I am aware of my emotions as I experience them"	3.77	0.88	–0.076
10. "I expect good things to happen"	3.82	1.02	–0.313*[b]
12. "When I experience a positive emotion, I know how to make it last"	3.13	1.017	–0.204*[a]
13. "I arrange events others enjoy"	3.96	0.83	–0.091*[a]
14. "I seek out activities that make me happy"	3.95	0.90	–0.209*[a]
17. "When I am in a positive mood, solving problems is easy for me"	4.07	0.82	–0.210*[a]
20. "When I am in a positive mood, I am able to come up with new ideas"	4.18	0.77	–0.104*[a]
22. "I easily recognise my emotions as I experience them"	3.78	0.94	–0.182*[a]
23. "I motivate myself by imagining a good outcome to tasks I take on"	3.98	1.04	–0.221*
27. "When I feel a change in emotions, I tend to come up with new ideas"	3.48	0.92	–0.12*[a]
30. "I help other people feel better when they are down"	4.06	0.81	0.003
31. "I use good moods to help myself keep trying in the face of obstacles"	3.99	0.84	–0.122*[a]

EI – emotional intelligence.
* $p < 0.05$.
[a] Small effect size; [b] Average effect size.
Source of questions: [33].

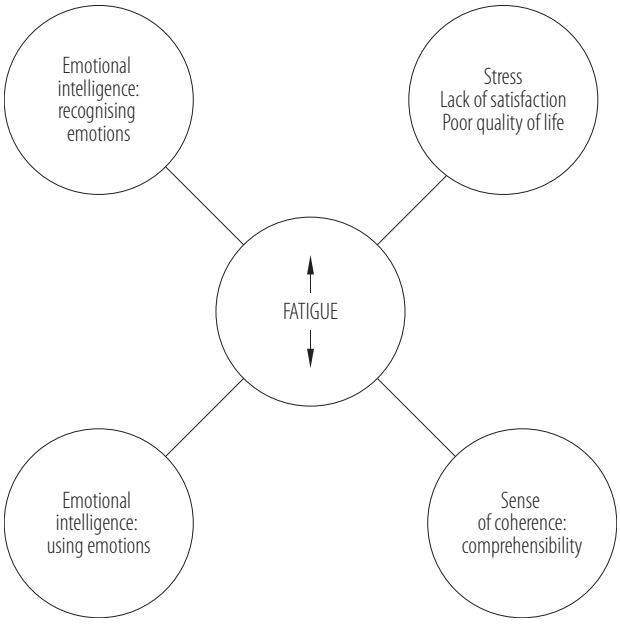

Figure 1. Psychological factors connected with fatigue in second-year medical students, 2018–2019, Medical University of Gdańsk, Poland

of others (EI). This result was expected by the authors – medical students who have a higher ability to use emotions to solve problems may use this strategy to cope with the requirements of their studies and treat them as a challenge. This dimension of intelligence might be especially useful in their discipline. The authors may hypothesise that using emotions to solve issues provides relief and results in less fatigue. However, it is unclear how such a strategy could be adaptive in the long term. Abdali et al. [9] found a negative correlation between EI and general fatigue in medical students, though it should be noted, that their study was conducted in a different cultural context and included a more broadly defined group of students (i.e., Iranian medical, nursing, and paramedical science students). Also, the authors used a different tool to measure EI (*Bradbury-Graves's Emotional Intelligence Inventory*). Further studies amongst other groups are needed in this area. Analysing these relationships, taking into account the cultural context, seems to be important in view of, for example, policies against professional burnout among health professions and ways of educating medical students.

Third, another factor analysed for relations with fatigue was the sense of coherence. One aspect of SoC – comprehensibility – correlated inversely with fatigue. This aspect is based on the idea that the stimuli emerging from one's internal and external environments are structured, predictable, and explicable [21]. In the present study, the participants who saw the world as predictable and explainable appeared to be less burdened by their studies and seemed to experience the associated challenges differently. This was both a positive and an expected result and in keeping with the SoC literature [24–27]. The authors speculate that medical students might try to use such it as an internal resource. Early identification of those who do not possess this internal resource might help avoid deleterious consequences. Investing in the development of comprehensibility could enable them to adapt to the requirements of their education and career.

CONCLUSIONS

It is hoped that the results of the present study will help medical educators to identify students at high risk of overload and conduct early interventions to ensure a lower incidence of fatigue, notwithstanding the availability of resources. Medical student training should pay closer attention to the issue of fatigue. The results allow a better understanding of the relationship between the selected variables and individual differences. The timely recognition of certain psychological characteristics, such as emotional misunderstanding and the misperception of environments as unstructured, should make it more possible to put in place early support and development programmes. This is important, given the growing number of psychological problems faced by medical students and the high costs of medical education. Investing in medical students' health prophylaxis may result in longer and more successful careers. The authors believe that this may

be a clue for organizations/opinion-forming structures creating health policy.

Limitations

The study has some limitations that may be addressed in future research, though, to the best of authors' knowledge, no previous studies have investigated the association of fatigue with IE and SoC in medical students. First, the sample size was small (N = 566), which means that the results cannot be generalised. Second, the cross-sectional nature of the data. This means that no cause-and-effect relationships could be established. Third, participants were not randomly assigned. Fourth, the research involved a second-year medical student population only. Therefore, studies involving a wider range of participants are needed.

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