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Determinants of burnout syndrome among undergraduate nursing students in Poland: a cross-sectional study

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Abstract

Background Nursing students worldwide are exposed to burnout syndrome resulting from constant academic and clinical stressors. The consequences of student burnout can be related to the student's mental and physical health. Burnout may affect the learning process, achieving professional skills, and future effectiveness while working with a patient and, eventually, might lead to the decision to quit the job. This study aims to analyze the intensity of burnout syndrome among undergraduate nursing students based on their year of study (1), establishing the impact of stress, anxiety, insomnia, and selected sociodemographic variables on the level of burnout (2) and establishing a student profile predestined to be affected by burnout (3).

Methods A cross-sectional study was conducted among 841 bachelor's degree nursing students from March 2022 to June 2022. The Maslach Burnout Inventory, Athens Insomnia Scale, Modified Hospital Anxiety and Depression Scale, and Perceived Stress Scale were used.

Results High levels of emotional exhaustion were found in 40.9% and depersonalization in 20.33%, while low personal accomplishment was found in 16.88% of the students. Students of nursing in Year 2 presented the highest levels of emotional exhaustion and depersonalization and achieved significantly higher scores on the Athens Insomnia Scale. The determinants of burnout syndrome identified by the regression analysis were: sociodemographic factors (age, gender, and financial resources), the factors connected with the studying environment (year of studies and clinical and academic stressors), and emotional/mental/interpersonal factors (anxiety, depression, insomnia, and intensity of stress related to life situations).

Conclusion The academic community should be encouraged to create a more supportive environment for students, which will ultimately prevent dropouts and increase the number of nursing professionals in the Polish healthcare system. We recommended carrying out regular screening tests for burnout, insomnia, anxiety, stress, and depression (e.g., once a year) among students. Depending on the results of the tests, implementation of interventions aiming at reducing the negative outcomes of burnout syndrome and promoting well-being and adaptive management mechanisms should be considered.

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Keywords Psychological burnout, Psychological stress, Nursing students, Anxiety, Depression

Background

Nursing students worldwide are exposed to burnout syndrome resulting from constant academic and clinical stressors [1–5]. What is more, nursing students experience higher stress and burnout levels than students in other health professions [6]. Student burnout is described in the scientific literature as a process consisting of three major features: emotional exhaustion, apathy, and incompetence. The first refers to the feeling of fatigue which is connected with educational demands. Apathy applies to cynicism and distancing to one's education. The latest is related to a lack of personal competence as a student [7]. Consequences of student burnout can be related to the student's mental and physical health [8]. Burnout may also affect the process of learning, achieving professional skills, and future effectiveness while working with a patient and, eventually, might lead to the decision to quit the job [9–11].

First-degree nursing studies can be very challenging and stressful for a student due to the transition from basic to higher education, the academic workload (examinations and assignments), and the pressures associated with gaining practical healthcare experience [12, 13]. In Poland, nurses and midwives are educated under the *Directive 2005/36/EC of The European Parliament And Of The Council* [14]. First-degree studies last at least three years, not fewer than 6 semesters. According to the *Ordinance of The Minister Of Science And Higher Education* [15], the overall number of theoretical and practical training hours cannot fall below 4720, of which 2300 constitute practical classes and internships performed in hospital wards in internal, geriatric, surgical, neurological, psychiatric, intensive care, long term care, primary health care, hospice, etc. The number of hours remains the same for both full and part-time studies.

To ensure patient safety and high-quality care, nursing students need to master theoretical knowledge and practical skills. Managing medications, administering CPR, reading EKGs, starting intravenous lines, and organizing work effectively are some examples of these abilities [16–19]. Nursing skills also include building relationships with patients, dealing with ethical problems, and making decisions that follow ethical principles. This is because there is a positive correlation between being able to think morally and making ethical decisions [18, 20, 21]. Even though the health sector is dynamic and unpredictable, nurses must be able to adapt and respond appropriately to a range of situations, so students also need to learn critical thinking skills [22]. All the factors mentioned above might constitute strong stressors, which, depending on an individual's predispositions, may affect one's quality of life to different degrees and, as a result, initiate burnout syndrome [23, 24]. Previous studies showed that student burnout is correlated with stress, anxiety, and depression [25, 26].

The research results regarding the frequency of burnout symptom prevalences are inconclusive. According to the meta-analysis by Gómez-Urquiza et al., (34 studies, $n = 2744$ nursing students), the prevalence of burnout and its dimensions varied from 19 to 41% [27]. Vasconcelos et al. showed that 20% of nursing students revealed burnout symptoms, including 75% having a high level of emotional exhaustion, 29% with a high level of disbelief, and 33% with a low level of accomplishment [2]. Brazilian studies showed that the prevalence of burnout among subjects was 10.5% [4]. The frequency of burnout among Chinese students was 31.5% [28]. Lopes et al. found that 6% of their students presented high burnout, including 36.3% with high emotional exhaustion, 37.7% with high depersonalization, and 28.2% with low levels of personal accomplishment [29]. In turn, a systematic review by Kong et al. reported the overall frequency of burnout among nursing students at 23.0%, with the frequency of emotional exhaustion, depersonalization, and lowered personal accomplishment at levels of 47.1%, 32.25%, and 43.5%, respectively [23]. Factors affecting nursing student burnout include: gender, marital status, number of children, difficulties in relations with others, year of study, satisfaction with study results, quality and flexibility of learning, the personal characteristics of the student, sleeping disorders, the sense of belonging to an interdisciplinary team, and interactions with colleagues in a clinical practice environment [28, 30–36].

In the scientific literature, we found research focused on the phenomenon of occupational burnout among nursing professionals; however, it is worth highlighting that there is no current research referring to the phenomenon of burnout among nursing students in Poland [37, 38]. Meanwhile, according to the report Staffing Disaster For Nurses And Midwives, issued by The Head Chamber of Nurses and Midwives, Poland is affected by nursing staff shortages [39]. The Head Chamber of Nurses and Midwives recommends educating 20 thousand nursing and midwifery students a year to achieve an average rate of nurses at a level of 9.4 (OECD) in a 15-year period. However, to maintain the current level of 5.2 per 1 thousand inhabitants, no matter how low in comparison to other European countries it seems to be, it is necessary to increase the number of students from 5.6 thousand today to 10 thousand a year. Between 2021 and 2022, only 60% of the nursing graduates started their nursing careers (the ratio of the number of nurses employed to

those registered in 2022 amounted to 66.66% and in 2021 to 67.19%) [40]. Therefore, it can be concluded that nursing students complete their educational qualifications, but some of them do not start their professional nursing careers. This phenomenon is even more alarming if we consider the aging demographic process in European societies, including in Poland, and the growing demand for nursing services in coming years [41]. Furthermore, the average age of a nurse in Poland is 54 years old. According to the report we mentioned above, 30% of the working nurses have already gained their pension rights, and by 2030, 65% of the currently employed nurses will have achieved one [40]. Taking all these facts into serious consideration, we can conclude that there is a strong demand for new nurses and a significant need to take good care of the present nursing students to ensure the largest possible number of graduates will be introduced into the healthcare system of Poland.

In light of the above, it is really interesting to know what factors determine Polish nursing student burnout and the level of the phenomenon for each aspect. The results collected are expected to serve to adjust proper burnout prevention programs. The study aimed to analyze the intensity of burnout syndrome among undergraduate nursing students depending on the year of study, establish the impact of stress, anxiety, insomnia, and selected sociodemographic variables on the level of burnout, and establish a student profile predestined to be affected by burnout. We hypothesized that there is a profile for students who are predisposed to emotional exhaustion, depersonalization, and low personal accomplishment.

Methods

Study design and setting

This was a cross-sectional study conducted from March 2022 to June 2022. The research was carried out in Polish medical higher education institutions, educating nursing students in their first-degree studies (Bachelor's degree). The study is part of a greater project aimed at not only analyzing burnout determinants but also those for stress and insomnia. This study presents only the results achieved considering burnout. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines were followed.

Data collection

The study was conducted among Bachelor's degree nursing students of 6 higher education institutions from the voivodeships of Silesian, Opolskie, and Lubuskie (Poland). Education institutions were purposively selected for the research sample. To objectify the results of the student selection process, the authors aimed to select students from two universities, two state higher vocational schools, and two private institutions. A non-probability sampling method was applied to the students (only volunteers were recruited). The inclusion criteria included being an adult, a student of first-degree nursing studies of the institution invited to participate, and a native speaker of Polish, capable of both speaking and writing. The examinees who did not meet the criteria above (including second-degree nursing students) were excluded from the study.

The examination was carried out by the authors of the study, being the educational institutions' lecturers. Before the examination, each student was informed about the aim, method, and possibility of withdrawal at any stage of the research. The examinees were also assured full anonymity and informed of the voluntary nature of the study. The students filled in the questionnaire personally (paper-pen method). They received anonymous questionnaires with blank envelopes. After the students had completed the questionnaires, they put them in the envelopes, sealed them, and submitted them to the researcher. Initially, 902 students accepted the invitation to the study but only 866 questionnaires were submitted (the return coefficient – 96%). Of the submitted questionnaires, 25 of them were incorrectly filled in or lacked some important data and were excluded from the study. Consequently, 841 questionnaires were used for the analysis.

Data sources/measurement

The research was conducted according to the diagnostic survey method using the questionnaire technique. The following testing tools were used:

Maslach Burnout Inventory (MBI) evaluates three aspects of burnout syndrome: emotional exhaustion, depersonalization or cynicism, and low (reduced) personal accomplishment [42]. It consists of 22 test questions. The answers are given according to the 7-point scale of frequency where 0 means 'never' and 6 'every day'. The score is calculated separately for each subscale by adding the points in each aspect: emotional exhaustion—high (>27), moderate [17–26], and low (0–16); depersonalization—high (>13), moderate [7–12], and low (0–6); personal accomplishment—high (0–31), moderate [32–38], and low (>39). The higher the scores on the emotional exhaustion and depersonalization scales, the more intense the burnout is, while the lower the score on the sense of accomplishment scale, the higher the indicator of burnout. The MBI questionnaire has been used before to examine nursing student burnout [4, 29, 43]. To apply this tool for our research, it was necessary to change some words with concurrent retention of their meaning and sense. The changes included: 'my work', which was replaced with 'my practical classes and internships'. The number of subscale positions and the pattern of result calculations maintained the same. The internal

consistency coefficients calculated for our research sample were as follows: emotional exhaustion – 0.865, depersonalization – 0.753, and personal accomplishment – 0.779.

The *Athens Insomnia Scale (AIS)* provides a quantitative measurement of insomnia symptoms [44]. The scale consists of 8 closed-end questions with 4 possible answer options. A score of 5 points indicates a normal level; however, results from 6 to 10 points identify a deviation from the norm (increased risk of insomnia). Finally, a result above 11 points indicates insomnia. The internal consistency coefficient calculated from our research sample was 0.839.

Modified Hospital Anxiety and Depression Scale (HADS-M) is one of the most commonly used screening methods for assessing the level of anxiety and depression. The scale consists of 16 closed-end questions with 4 possible answer options. Scores of 0–7 indicate normal levels of anxiety and depression, 8–10 indicate borderline abnormal anxiety and depression levels, and 11–21 indicate high levels, suggesting the disease [45]. The internal consistency coefficients calculated from our research sample were as follows: anxiety — 0.807, depression — 0.81, and aggression — 0.78.

The Perceived Stress Scale (PSS-10) aims to assess the intensity of stress related to one's life situation within the last month. It consists of 10 questions referring to subjective feelings connected with personal issues and events, behaviors, and ways to deal with them. An examinee evaluates each statement on a 4-degree scale (0 – 'never', 1 – 'hardly ever', 2 – 'sometimes', 3 – 'quite often', and 4 – 'very often'). The overall result is the sum of all points (from 0 to 40). The higher the result, the higher the intensity of stress experienced [46]. The internal consistency coefficient calculated from our research sample was 0.863.

The authors' own questionnaire consisted of two parts. Part one collected sociodemographic data (7 questions). Part two, entitled "Stressors related to academic and clinical practice", included 17 statements related to situations that might be stressful for a student while contacting a patient during practical classes or internships, as well as others connected with difficulties, challenges, and issues arising while learning theoretical subjects. The statements were created and chosen by the authors (K.S. and W.K.) based on the review of existing literature [47–49]. The statements chosen fell into two subscales: clinical stressors (9 items) and academic stressors (8 items). The examinee was supposed to evaluate each statement using a 5–degree Likert Scale (1 – never, 2 – hardly ever, 3 – sometimes, 4 – quite often, 5 – very often). The highest possible score was 45 for the clinical subscale and 40 for the academic subscale. The higher the score, the higher the intensity of stressors. The α - Cronbach coefficient for the tool was 0.856, whereas, individually, the clinical stressors subscale – 0.789 and academic subscale – 0.799. To sum up, it can be concluded that the tool itself and both subscales are reliable.

Study size

Based on the data published by The Ministry of Health, the number of nursing students accepted for first-degree studies was as follows: 6652 in 2018/2019, 7840 in 2019/2020, and 8202 in 2020/21; which amounts to 22,694 students for all three years. With a confidence level of 95%, a margin of error of 5%, and a $p = 50\%$, the minimum study sample was set at 378 subjects. Therefore, it must be stated that the number of students examined for the study (841) was sufficient.

Statistical methods

For quantitative variables - means, standard deviations, medians, and quartiles were calculated. For qualitative variables - the number and percentage of occurrences of each value were counted. The comparison of qualitative variables was performed with a chi-square test (with Yate's correction for Table 1×1) or Fischer's exact test when low expected numbers appeared in the tables. The normality of the distribution of variables was tested using the Shapiro-Wilk test. In the case of non-compliance of the distribution of the variables with a normal distribution, non-parametric tests (Mann-Whitney's test or Kruskal-Wallis test) were used. The comparison of quantitative variables between two groups was assessed with the Mann-Whitney's test and between three groups with the Kruskal-Wallis test. After statistically significant differences were found, Dunn's post hoc test was used to identify the groups that were statistically different.

One or multi-factorial analysis of the influence of many variables on the quantitative variable was conducted using the linear regression method. The results were presented in the form of the parameter values of the regression model with 95% confidence intervals. Missing and incomplete data were excluded from univariate and multivariate models. The regression calculation included all potential determinants (no selection was performed) because of the high ratio of the observation number to the number of variables (SPV, *subjects per variable*), which amounted to 52. The significance level for the study was assumed at the level of 0.05. Therefore, all p-values below 0.05 were interpreted as showing significant correlations. The analysis was performed with the use of programme R, version 4.2.1.

Ethical considerations

Ethics approval was obtained from The Ethics Committee at the Silesian University of Medicine in Katowice (No 02/KEBN/2022). The research was conducted according

Table 1 Sociodemographic data of the surveyed students ($n = 841$)

Parameter		Year of the study				p
		Year 1 (N = 350)	Year 2 (N = 256)	Year 3 (N = 235)	Total (N = 841)	
Sex	Men	50 (14.29%)	30 (11.72%)	22 (9.36%)	102 (12.13%)	p = 0.196
	Women	300 (85.71%)	226 (88.28%)	213 (90.64%)	739 (87.87%)	
Place of residence	Village	99 (28.29%)	74 (28.91%)	73 (31.06%)	246 (29.25%)	p = 0.761
	City	251 (71.71%)	182 (71.09%)	162 (68.94%)	595 (70.75%)	
Marital status	Single	174 (49.71%)	112 (43.75%)	88 (37.45%)	374 (44.47%)	p = 0.014 *
	Married/in a civil partnership	176 (50.29%)	142 (55.47%)	147 (62.55%)	465 (55.29%)	
	No data	0 (0.00%)	2 (0.78%)	0 (0.00%)	2 (0.24%)	
Work during studies	No	85 (24.29%)	68 (26.56%)	46 (19.57%)	199 (23.66%)	p = 0.172
	Yes	265 (75.71%)	187 (73.05%)	189 (80.43%)	641 (76.22%)	
	No data	0 (0.00%)	1 (0.39%)	0 (0.00%)	1 (0.12%)	
Financial resources meet my needs	No	70 (20.00%)	69 (26.95%)	68 (28.94%)	207 (24.61%)	p = 0.114
	Yes	161 (46.00%)	117 (45.70%)	99 (42.13%)	377 (44.83%)	
	Hard to say	113 (32.29%)	69 (26.95%)	67 (28.51%)	249 (29.61%)	
	No data	6 (1.71%)	1 (0.39%)	1 (0.43%)	8 (0.95%)	

Legend: MBI – Maslach Burnout Inventory, p – chi-square test or Fisher's exact test, * statistically significant difference ($p < 0.05$)

Table 2 Level of burnout among nursing students depending on the year of study

Parameter			Year of the study				p
			year 1 (N = 350)	Year 2 (N = 256)	Year 3 (N = 235)	Total (N = 841)	
MBI: Emotional exhaustion	Low	(do 16 pts)	127 (36.29%)	44 (17.19%)	63 (26.81%)	234 (27.82%)	p < 0.001 *
	Medium	(17–26 pts)	111 (31.71%)	85 (33.20%)	67 (28.51%)	263 (31.27%)	
	High	(27 pts and more)	112 (32.00%)	127 (49.61%)	105 (44.68%)	344 (40.90%)	
MBI: Depersonalization	Low	(do 6 pts)	202 (57.71%)	112 (43.75%)	127 (54.04%)	441 (52.44%)	p = 0.016 *
	Medium	(7–12 pts)	84 (24.00%)	85 (33.20%)	60 (25.53%)	229 (27.23%)	
	High	(13 pts and more)	64 (18.29%)	59 (23.05%)	48 (20.43%)	171 (20.33%)	
MBI: Personal accomplishment	High	(do 31 pts)	205 (58.57%)	145 (56.64%)	122 (51.91%)	472 (56.12%)	p = 0.419
	Medium	(32–38 pts)	85 (24.29%)	73 (28.52%)	69 (29.36%)	227 (26.99%)	
	Low	(39 pts and more)	60 (17.14%)	38 (14.84%)	44 (18.72%)	142 (16.88%)	

Legend: MBI – Maslach Burnout Inventory, p – chi-square test or Fisher's exact test, * statistically significant difference (p < 0.05)

to the requirements of the Declaration of Helsinki of 1975 (amended in 2013) and Good Clinical Practice.

Results

Participants

The sample group consisted of 841 nursing students, including 739 women (87.87%) and 102 men (12.13%). The average age of the examinees was 28.24 ± 8.6 (year 1–27.38 ± 8.42, year 2–28.65 ± 8.70, year 3–29.08 ± 8.67). The examinees were most often city residents (595, 70.75%). Most declared living with partners (465, 55.29%) and working while studying (641, 76.22%). Students in their 1st, 2nd, and 3rd year of studies did not differ significantly in terms of sex ($p = 0.196$), place of residence ($p = 0.761$), performing work during studies ($p = 0.172$), and the opinion that their financial resources allow them to meet their own needs ($p = 0.114$). The respondents differed statistically significantly in terms of marital status, i.e., the higher the year of studies, the higher the percentage of students in a relationship ($p = 0.014$, Table 1).

Level of burnout syndrome in nursing students

Emotional exhaustion was high in 40.9% ($n = 334$) of the examinees, while it was medium in 31.27% ($n = 263$), and low in 27.82% ($n = 234$). Moreover, it was the highest among Year 2 students and the lowest among Year 1 students ($p < 0.001$).

High depersonalization was found in 20.33% ($n = 171$) of the students, whereas 27.23% ($n = 229$) reported medium levels, and more than half reported low levels (52.44%, $n = 441$). Depersonalization was at a significantly high level among Year 2 students and lowest in Year 1 students ($p = 0.016$).

The low personal accomplishment was reported by 16.88% ($n = 142$) of the respondents, while in 26.99% ($n = 227$), it was medium, and in 56.12% ($n = 472$), it was high (Table 2).

Average values for burnout syndrome, anxiety, depression, insomnia, and stress intensity considering different years of studies

The research group displayed average values in such aspects as emotional exhaustion (M = 23.40; SD = 11.21), depersonalization (M = 7.24; SD = 6.04), and personal accomplishment (M = 30.29; SD = 8.34).

The mean of the depersonalization subscale (MBI) was significantly higher in Year 2 than in Year 1 students (Year 2–8.00 ± 6.08 vs. Year 1–6.63 ± 5.66, $p = 0.026$). On the emotional exhaustion subscale (MBI), the mean was higher in Year 2 than in Year 3 students, while in Year 3, it was significantly higher than in Year 1 students (Year 3–26.38 ± 10.19 vs. Year 2–24.38 ± 12.07 vs. Year 1 20.56 ± 10.67, $p < 0.001$).

The students in Year 2, in comparison to those in Year 1 and 3, achieved significantly higher values ($p = 0.008$) on the intensity of insomnia subscale (Year 2–9.86 ± 4.62 points vs. Year 1–8.88 ± 4.43 points and Year 3–8.73 ± 4.86 points). Moreover, the Year 2 students had significantly higher values ($p = 0.021$) in levels of anxiety than those in Year 1 or 3 (Year 2–9.58 ± 4.22 points vs. Year 1–8.83 ± 4.37 and Year 3–8.64 ± 4.48).

The mean value on the clinical stressors subscale was higher in Year 2 students compared to Year 3, which was significantly higher than in Year 1 (Year 2–24.94 ± 6.05 vs. Year 3–23.66 ± 6.34 vs. Year 1–22.33 ± 5.98, $p < 0.001$). The results on the academic stressors subscale were also significantly higher for Year 2 or 3 students than for Year 1 students (Year 2–27.72 ± 5.50 vs. Year 3–27.01 ± 6.34 vs. Year 1–24.75 ± 5.96, $p < 0.001$).

The examinees of all years were quite similar to each other in terms of the intensity of stress related to their life situation within the last month ($p = 0.151$), personal accomplishment ($p = 0.093$), and the intensity of depression ($p = 0.404$) (Table 3).

Determinants of emotional exhaustion

The direct determinants of emotional exhaustion proved to include variables such as age, Year 2 of studies, Year 3 of studies, difficulties in evaluation, whether financial resources meet one's needs, the intensity of insomnia, the level of anxiety and depression, the intensity of stress related to one's life situation within last month, and the aggravation of clinical and academic stressors. The multi-factorial analysis revealed that every subsequent year of the student's age lowered the score on the emotional exhaustion subscale by approximately 0.088 points (regression parameter – 0.088). Year 2 increased scores on the subscale by an average of 2.472 points compared to Year 1 (regression parameter 2.472), while Year 3 increased the value by approximately 1.996 points in comparison to Year 1 (regression parameter 1.996). Moreover, the doubts in the evaluation of whether financial resources meet one's needs lowered the level of emotional exhaustion on average by 1.559 points in situations where the evaluation of the statement was negative (regression parameter – 1.559). Each point on the insomnia subscale increased the level of emotional exhaustion by approximately 0.273 points (regression parameter 0.273). Each point on the anxiety subscale aggravated the score on average by 0.302 points (regression parameter 0.302). Each point on the depression subscale increased the level by 0.344 points on average (regression parameter 0.344), and each point on the scale of stress related to one's life situation within the last month (PSS-10) elevated the level of emotional exhaustion by approximately 0.16 points (regression parameter 0.16). Each point on the clinical stressors subscale lifted the emotional exhaustion score by 0.263 points on average (regression parameter 0.263) and academic stressors by approximately 0.637 points (regression parameter 0.637, Table 4).

Determinants of depersonalization

The direct determinants of depersonalization were found to be variables such as being female, difficulties in evaluating whether financial resources meet one's needs, the level of depression, and the intensity of clinical and academic stressors. The multi-factorial analysis showed that being female decreased the score on the depersonalization subscale by 2.105 points on average (regression parameter – 2.105), while difficulties to evaluate whether financial resources meet one's needs by approximately 1.287 points compared to the opinion that they do not (regression parameter – 1.287). Each point on the depression subscale lowered the score on the depersonalization subscale by approximately 0.404 points (regression parameter 0.404), while each point on the clinical stressors subscale increased the score by 0.151 points on average (regression parameter 0.151) and on the academic stressors subscale by approximately 0.161 points (regression parameter 0.161, Table 5).

Determinants of personal accomplishment

The direct determinants of low (reduced) personal accomplishment included variables such as age, being female, Year 3 of studies, the intensity of depression, and clinical stressors. The multi-factorial analysis presented that each increase in the year of age increased the score on the personal accomplishment subscale by approximately 0.12 points (regression parameter 0.12), being female by approximately 2.719 points compared to being male (regression parameter 2.719), and Year 3 by 1.413 points on average when compared to Year 1 (regression parameter 1.413). Each point on the depression subscale decreased the score by approximately 0.459 points (regression parameter – 0.459), while each point on the

Table 3 Burnout, anxiety, depression, insomnia, and stress intensity varied across different levels of education

Parameter	Year of the study	*N*	M	SD	Median	Min	Max	Q1	Q3	*p*
AIS	Year 1	350	8.88	4.43	9.0	0	22.86	6.00	11.32	$p=0.008$ *
	Year 2	256	9.86	4.62	10.0	1	23.00	6.75	13.00	II > I, III
	Year 3	235	8.73	4.86	8.0	0	24.00	5.00	12.00	
	Total	841	9.14	4.63	9.0	0	24.00	6.00	12.00	
MBI: Emotional exhaustion	Year 1	350	20.56	10.67	21.0	0	54.00	13.00	28.00	$p<0.001$ *
	Year 2	256	26.38	10.19	26.0	1	51.00	19.00	35.00	II > III > I
	Year 3	235	24.38	12.07	25.0	0	54.00	16.00	32.50	
	Total	841	23.40	11.21	24.0	0	54.00	15.00	31.00	
MBI: Depersonalization	Year 1	350	6.63	5.66	5.0	0	30.00	2.00	10.00	$p=0.026$ *
	Year 2	256	8.00	6.08	7.5	0	28.00	3.00	12.00	II > I
	Year 3	235	7.32	6.45	6.0	0	26.00	2.00	11.00	
	Total	841	7.24	6.04	6.0	0	30.00	2.00	11.00	
MBI: Personal accomplishment	Year 1	350	29.81	8.58	30.0	0	48.00	24.00	36.00	$p=0.093$
	Year 2	256	30.11	8.22	30.0	8	48.00	24.75	36.00	
	Year 3	235	31.21	8.07	31.0	0	48.00	26.14	36.00	
	Total	841	30.29	8.34	31.0	0	48.00	25.00	36.00	
HADS: Anxiety	Year 1	350	8.83	4.37	9.0	0	20.00	6.00	12.00	$p=0.021$ *
	Year 2	256	9.58	4.22	10.0	0	20.00	6.00	12.00	II > I, III
	Year 3	235	8.64	4.48	8.0	0	21.00	6.00	11.00	
	Total	841	9.00	4.37	9.0	0	21.00	6.00	12.00	
HADS: Depression	Year 1	350	5.95	4.03	6.0	0	21.00	3.00	9.00	$p=0.404$
	Year 2	256	6.32	3.91	6.0	0	18.00	3.00	9.00	
	Year 3	235	6.03	4.26	6.0	0	20.00	2.00	9.00	
	Total	841	6.09	4.06	6.0	0	21.00	3.00	9.00	
PSS-10	Year 1	350	19.79	7.03	20.0	0	40.00	16.00	24.00	$p=0.151$
	Year 2	256	20.77	6.88	21.0	1	39.00	17.00	25.00	
	Year 3	235	20.17	7.01	20.0	0	38.00	15.00	24.50	
	Total	841	20.20	6.98	20.0	0	40.00	16.00	25.00	
Clinical stressors	Year 1	350	22.33	5.98	22.0	9	41.00	18.00	26.00	$p<0.001$ *
	Year 2	256	24.94	6.05	25.0	11	45.00	21.00	29.00	II > III > I
	Year 3	235	23.66	6.34	23.0	11	43.00	19.00	28.00	
	Total	841	23.50	6.19	23.0	9	45.00	19.00	28.00	
Academic stressors	Year 1	350	24.75	5.96	25.0	8	38.00	21.00	29.00	$p<0.001$ *
	Year 2	256	27.72	5.50	28.0	14	39.00	24.00	32.00	II, III > I
	Year 3	235	27.01	6.34	28.0	8	40.00	23.00	32.00	
	Total	841	26.29	6.07	27.0	8	40.00	22.00	31.00	

Legend: AIS – Athens Insomnia Scale, MBI – Maslach Burnout Inventory, HADS: Hospital Anxiety and Depression Scale, p – Kruskal-Wallis test + post hoc analysis (Dunn test), M – mean, SD – standard deviation, Q1 – first quartile, Q3 – third quartile, * statistically significant dependence ($p<0.05$)

clinical stressors subscale lowered the score by approximately 0.196 points (regression parameter – 0.196, Table 6).

Discussion

This study aimed to analyze the degree of burnout syndrome depending on the year of study as well as determining the factors that influence the three aspects of burnout, such as stress, anxiety, and insomnia and other sociodemographic data. Eventually, the study's goal was to establish a profile of a student who might be predestined for burnout syndrome.

The analysis of burnout syndrome aspects

The examined students achieved average scores in all burnout domains. High levels of emotional exhaustion were found in 40.9% and depersonalization in 20.33%, while low personal accomplishment (> 39 points) in 16.88% of the students. Comparing the results with a recent meta-analysis by Gómez-Urquiza, Velando-Soriano [27], it might be concluded that the results are quite similar in the aspects of emotional exhaustion (40.90% vs. 41%) and depersonalization (20.33% vs. 25%). However, the scores for personal accomplishment varied (16.88% vs. 27%). In our study, emotional exhaustion noted quite unfavorable results. Both longitudinal studies by Ríos-Risquez et al. and meta-analysis by Gómez-Urquiza et al.

Table 4 Emotional exhaustion – univariate and multi-factorial regression analysis

Feature		Univariate Models				Multivariate Model			
		Parameter	95%CI		*p*	Parameter	95%CI		*p*
Age	[years]	-0.233	-0.32	-0.146	< 0.001 *	-0.088	-0.156	-0.02	0.012 *
Sex	Men	ref.				ref.			
	Women	0.105	-2.218	2.427	0.93	-1.432	-3.059	0.196	0.085
Place of residence	Village	ref.				ref.			
	City	-1.09	-2.755	0.575	0.2	-0.173	-1.332	0.986	0.77
Year of the study	Year 1	ref.				ref.			
	Year 2	5.818	4.054	7.581	< 0.001 *	2.472	1.187	3.758	< 0.001 *
	Year 3	3.823	2.014	5.631	< 0.001 *	1.996	0.689	3.303	0.003 *
Marital status	Single	ref.				ref.			
	Married/in a civil partnership	0.086	-1.441	1.613	0.912	0.369	-0.751	1.488	0.519
Work during studies	No	ref.				ref.			
	Yes	-1.891	-3.67	-0.112	0.038 *	1.023	-0.29	2.336	0.127
Financial resources meet my needs	No	ref.				ref.			
	yes	-4.911	-6.788	-3.034	< 0.001 *	-0.747	-2.085	0.591	0.274
	It is hard to say	-2.915	-4.956	-0.875	0.005 *	-1.559	-2.987	-0.13	0.033 *
AIS		1.159	1.015	1.302	< 0.001 *	0.273	0.128	0.418	< 0.001 *
HADS: Anxiety		1.346	1.199	1.494	< 0.001 *	0.302	0.105	0.5	0.003 *
HADS: Depression		1.367	1.205	1.529	<0.001 *	0.344	0.152	0.535	<0.001 *
PSS-10		0.817	0.724	0.911	< 0.001 *	0.16	0.046	0.275	0.006 *
Clinical stressors		0.859	0.751	0.967	< 0.001 *	0.263	0.161	0.366	< 0.001 *
Academic stressors		1.147	1.049	1.245	< 0.001 *	0.637	0.524	0.751	< 0.001 *

Legend: AIS – Athens Insomnia Scale, MBI – Maslach Burnout Inventory, HADS: Hospital Anxiety and Depression Scale, PSS-10 – Perceived Stress Scale, * statistically significant dependence ($p < 0.05$)

Table 5 Depersonalization – univariate and multi-factorial regression analysis

Feature		Univariate Models				Multivariate Model			
		Parameter	95%CI		*p*	Parameter	95%CI		*p*
Age	[years]	-0.067	-0.114	-0.019	0.006 *	-0.027	-0.074	0.02	0.256
Sex	Men	ref.				ref.			
	Women	-2.163	-3.405	-0.922	0.001 *	-2.105	-3.227	-0.983	< 0.001 *
Place of residence	Village	ref.				ref.			
	City	-0.24	-1.137	0.657	0.601	-0.054	-0.853	0.745	0.895
Year of the study	Year 1	ref.				ref.			
	Year 2	1.364	0.395	2.334	0.006 *	0.307	-0.58	1.193	0.498
	Year 3	0.691	-0.304	1.685	0.174	0.249	-0.652	1.15	0.589
Marital status	Single	ref.				ref.			
	Married/in a civil partnership	-0.721	-1.54	0.098	0.085	-0.753	-1.525	0.019	0.056
Work during studies	No	ref.				ref.			
	Yes	0.233	-0.725	1.192	0.633	1.282	0.377	2.187	0.006 *
Financial resources meet my needs	No	ref.				ref.			
	yes	-1.755	-2.771	-0.739	0.001 *	-0.435	-1.358	0.487	0.355
	It is hard to say	-1.922	-3.027	-0.817	0.001 *	-1.287	-2.272	-0.302	0.011 *
AIS		0.371	0.286	0.455	< 0.001 *	0.1	0	0.2	0.051
HADS: Anxiety		0.414	0.325	0.503	< 0.001 *	0.039	-0.098	0.175	0.578
HADS: Depression		0.575	0.482	0.667	< 0.001 *	0.404	0.272	0.537	< 0.001 *
PSS-10		0.214	0.158	0.271	< 0.001 *	-0.076	-0.155	0.003	0.06
Clinical stressors		0.313	0.25	0.375	< 0.001 *	0.151	0.081	0.222	< 0.001 *
Academic stressors		0.334	0.27	0.397	< 0.001 *	0.161	0.083	0.239	< 0.001 *

Legend: AIS – Athens Insomnia Scale, MBI – Maslach Burnout Inventory, HADS: Hospital Anxiety and Depression Scale, PSS-10 – Perceived Stress Scale, * statistically significant dependence ($p < 0.05$)

Table 6 Lack of personal accomplishment – univariate and multi-factorial regression analysis

Feature		Univariate Models				Multivariate Model			
		Parameter	95%CI		*p*	Parameter	95%CI		*p*
Age	[years]	0.197	0.132	0.261	<0.001 *	0.12	0.053	0.188	0.001 *
Sex	Men	ref.				ref.			
	Women	2.747	1.03	4.465	0.002 *	2.719	1.103	4.334	0.001 *
Place of residence	Village	ref.				ref.			
	City	-0.143	-1.383	1.097	0.821	-0.444	-1.594	0.707	0.45
Year of the study	Year 1	ref.				ref.			
	Year 2	0.297	-1.046	1.639	0.665	1.007	-0.269	2.283	0.122
	Year 3	1.397	0.021	2.774	0.047 *	1.413	0.116	2.71	0.033 *
Marital status	Single	ref.				ref.			
	Married/in a civil partnership	1.137	0.003	2.272	0.05 *	0.096	-1.015	1.208	0.865
Work during studies	No	ref.				ref.			
	Yes	1.82	0.498	3.142	0.007 *	0.153	-1.15	1.456	0.818
Financial resources meet my needs	No	ref.				ref.			
	yes	1.71	0.304	3.116	0.017 *	0.474	-0.854	1.802	0.485
	It is hard to say	0.424	-1.105	1.953	0.587	-0.002	-1.42	1.415	0.997
AIS		-0.407	-0.526	-0.289	< 0.001 *	-0.026	-0.17	0.118	0.728
HADS: Anxiety		-0.556	-0.68	-0.433	< 0.001 *	-0.015	-0.211	0.181	0.879
HADS: Depression		-0.711	-0.842	-0.581	< 0.001 *	-0.459	-0.649	-0.269	< 0.001 *
PSS-10		-0.34	-0.418	-0.263	< 0.001 *	-0.069	-0.183	0.045	0.235
Clinical stressors		-0.336	-0.425	-0.248	< 0.001 *	-0.196	-0.298	-0.095	< 0.001 *
Academic stressors		-0.278	-0.369	-0.187	< 0.001 *	-0.028	-0.141	0.085	0.626

Legend: AIS – Athens Insomnia Scale, MBI – Maslach Burnout Inventory, HADS: Hospital Anxiety and Depression Scale, PSS-10 – Perceived Stress Scale, * statistically significant dependence ($p < 0.05$)

indicated that this aspect constitutes the most important factor evoking student burnout [1, 27]. It is worth mentioning that an emotionally exhausted student might experience excessive tiredness, lack of energy to act, and might not notice opportunities to regenerate themselves. He/she is characterized by a lack of joy in life and increased irritation, impulsiveness, and inability to develop relations with others. What is more, lack of personal accomplishment may be manifested by the sense of low effectiveness in terms of effort put into learning, the fall in the sense of one's competencies as a nursing student, experiencing difficulties meeting the requirements set by lecturers and mentors, considering the whole process of studying nursing as a stressful burden [50]. In contrast, depersonalization is connected with negative and distant reactions to other people, loss of idealism, cynicism, and an indifferent attitude might lead to impersonal attitudes towards others and even inhumanity [51].

Student burnout determining factors

This research also focused on analyzing the components of burnout syndrome. The direct determinants were identified by regression analysis and included sociodemographic factors (age, gender, and financial resources), the factors connected with the study environment (year of studies and clinical and academic stressors), and the emotional/mental/interpersonal factors (anxiety, depression, insomnia, and intensity of stress related to life situation).

Sociodemographic factors

Existing research related to sociodemographic data correlations with burnout syndrome is inconclusive [3, 33, 52]. The self-reported study shows that gender did not affect the development of emotional exhaustion, but appeared to be a direct determinant of the other two burnout components. Being female decreased the depersonalization scale score, and also increased the score on the personal accomplishment subscale. It means that men are more susceptible to depersonalization, whereas women are more predestined to assess their personal accomplishments as low.

The multi-factorial analysis conducted for this study reported that every increased year of age lowered the student's score on the emotional exhaustion subscale and increased the score on the personal accomplishments subscale. This means that the older the student, the less susceptible to emotional exhaustion he/she is, but unfortunately, the less satisfied with their personal accomplishments. The research by Manzano-García et al., revealed that older participants had lower levels of burnout syndrome. This might be connected to gaining experience with age [53]. It ought to be considered that younger students possess less professional experience. Scientific literature reports that this lack of experience may

evoke tension and job stress resulting from various situations that students encounter in a clinical practice environment. A lot of students, while serving their clinical internships in an unknown environment, experience, so-called, transition shock manifested by anxiety, fear, nervousness, instability, low self-esteem in terms of duties performed, lack of competence, theoretical knowledge, and practical skills. Therefore, students affected by work stress, who also displayed negative attitudes towards theoretical and practical classes, may be susceptible to burnout [54]. Individual attention should be devoted to the study's findings, which conclude that a student's satisfaction with their own accomplishments decreases with age. The results by Gu et al., partly correspond with our results as the authors claim that the younger the nursing student is, the higher their levels of academic achievement [55]. It might stem from the fact that the younger the student is, the more interested they are in learning new subjects, and they display a greater willingness to acquire new knowledge, greater motivation to meet new friends, and a bigger desire to cooperate with them while studying.

Factors related to the learning environment

This self-reported study showed that such factors as the level of depersonalization, the intensity of anxiety, or clinical and academic stressors differentiated the nursing students by different years of studies. The students were, however, similar in the depression, intensity of concern about life situations within the last month, and personal accomplishment subscales.

Some researchers of previous studies have found that burnout syndrome develops at an early stage of nursing education and increases with each academic year and clinical training [56, 57]. The self-reported study presented that Year 2 is the most difficult for nursing students. It is based on the fact that both emotional exhaustion and depersonalization scores were highest among the students in Year 2. These examinees also reported the lowest results on the intensity of the insomnia subscale and the highest for the level of anxiety. In addition, the students of Year 2 achieved the highest average values on the intensity of clinical and academic stressors. It might be concluded that the correlation between the level of burnout and the year of study correlates with the results collected in the Brazilian research showing that the highest percentage of nursing students experiencing burnout was in Year 2 (37.5%) and Year 3 (33.3%) students – Year 2 and 3 were statistically and significantly related to burnout syndrome [2]. On the other hand, Chinese population research by Kong et al. reported contrary findings – the highest level of burnout was found in Years 1 and 2 in comparison to Years 3 and 4 [28]. It is important to mention, however, that both in Brazil and China, nursing studies last 4 years, whereas in Poland, they are only 3 years. This shorter period of studying in Poland may be seriously connected with a higher burden during the second year of studies. It may also be further related to the fact that in Year 2, students are more often introduced to complex and complicated clinical situations in medical simulation centers (high fidelity classes), during which they are forced to make more individual and responsible decisions and take part in a larger number of practical classes and internships in various hospital environments compared to Year 1 (more situations evoking the transition shock mentioned above). Students of Year 3 are, presumably, more experienced and self-confident about their knowledge and skills, which results from the previous experience gained. To confirm this thesis, it is necessary to conduct a separate study that aims to examine, for instance, the general sense of self-effectiveness, emotional self-control, personal competence, and the sense of coherence in relation to the year of study and the experience gained during clinical practice.

Emotional/psychological/interpersonal factors

Previous studies on personality traits showed that a proactive personality and a sense of self-effectiveness in nursing students correlated negatively with occupational burnout [28]. Emotional intelligence, together with emotional and cognitive empathy, is directly related to personal accomplishment [29, 31]. The self-reported study found that sleeping disorders, the level of anxiety, the intensity of depression, and stress related to one's life situation within the last month affected the aspects of burnout directly.

While analyzing sleeping disorders, it is worth mentioning that the average overall score on the AIS subscale for the whole sample group was 9.14 (elevated level), which indicates a risk for insomnia. What is more, the degree of insomnia appeared to be a direct determinant of emotional exhaustion. The greater the number of sleeping disorders, the higher the level of emotional exhaustion. According to the Polish research by Bodys-Cupak et al., conducted during the COVID-19 pandemic, sleeping disorders occurred in every third examinee, and the likelihood of insomnia prevalence amounted to 23.4% [58]. On the other hand, the results reported by Wang showed that poor sleeping quality of the students had a positive impact on the degree of burnout [59]. Moreover, Amaral demonstrated in their research, that 4.7% of their student examinees experienced burnout syndromes and, concurrently, 34.7% of all the respondents felt sleepy during the day, and 58.7% reported a low quality of sleep [36]. Consequently, the prevalence of excessive sleepiness during the day increases the risk of high emotional exhaustion and high depersonalization. All in all, sleeping

disorders were correlated with all aspects of burnout syndrome in this study.

The average point value for the intensity of depression in the whole sample group of the self-reported study was 6.09 ± 4.06 points (normal level), for the anxiety subscale, it was 9.00 ± 4.37 points (borderline/abnormal anxiety), and for the intensity of stress related to one's life situation, it was 20.20 ± 6.98 points (average level). The examinees also reported average values for clinical and academic stressor subscales – 23.50 and 26.29 points, respectively – which amounts to an average intensity for both stressors. However, the analysis of regression proved that depression and clinical and academic stressors constitute direct determinants of all aspects of burnout syndrome. This means that the higher the intensity of depression and stressors, the higher the chance of developing burnout among students. Moreover, anxiety and a high level of stress related to one's life situation predestined students to experience emotional exhaustion. In the research by Hwang et al., the nursing students' academic burnout was significantly and positively correlated with stress ($r = 0.52$, $p < 0.001$) and depression ($r = 0.44$, $p < 0.001$). Moreover, the authors confirmed that in 44% of the examinees, without experience in clinical practice, anxiety and depression influenced burnout, whereas stress and great satisfaction led to the phenomenon in 33% of those experienced in clinical practice [25]. Sonmez et al., who have conducted a longitudinal study, showed that during nursing education, factors such as prevalence of depression, intense anxiety, and psychological distress increased due to numerous stressful situations [60]. Stress and anxiety among students of nursing might adversely affect learning motivation, the process of learning itself, and academic results as well as clinical practice, communication with patients, and engagement in patient care. All these may give rise to the deterioration of nursing services served by a student [61]. Taking this into consideration, maintaining mental well-being at a high level in future healthcare workers should be a key point of nursing education.

Strengths and limitations of the study

By identifying the determinants of the components of burnout syndrome, this study is innovative in its attempts to determine a student profile at risk of developing emotional exhaustion, depersonalization, and a sense of low personal accomplishment. The strength of our study is the fact that it was conducted in several medical institutions in three voivodships. Examining students from both state and private institutions (universities and higher vocational schools) allows an increased objectivism of the results and constitutes another advantage. It is worth, however, in the future, to carry out some more research to determine whether there are any significant differences between state and private students. Due to the use of self-administered questionnaires, the study might have suffered from social desirability bias. Yet, it has to be noted that the questionnaires used for the study were all standardized, and the one created by the authors about clinical and academic stressors is characterized by high reliability based on the α-Cronbach coefficient for the whole test and its two subscales.

One of the limitations of the study is that we did not use random selection for the research sample, only purposive selection. We included volunteers in the sample, which may have affected the representativeness of the sample. What is more, both the historical data and recent data show that the nursing workforce in Poland is mainly women. Therefore, there were definitely more women than men in our survey, which is another limitation of our study [62, 63].

Certain limitations of our study resulted from its cross-sectional design. The inability to establish cause-and-effect relationships is one of the most important limitations. Our study does not provide information on the temporal sequence of events, making it difficult to infer the direction of associations. Furthermore, recall bias may result from participants' inaccurate recollections of prior exposures. Cross-sectional studies may not adequately account for confounding variables, which could result in improper associations being discovered.

The above limitations must be carefully considered when interpreting the results.

Conclusions

Second-year undergraduate nursing students demonstrated the highest levels of emotional exhaustion and depersonalization, and significantly higher scores for insomnia severity compared to the students of Years 1 and 3. It might result from high burdens created by theoretical knowledge in Year 2 and stress related to a huge variability of health care centers or hospital wards where they serve their internships and take part in practical classes.

Emotional exhaustion is significantly associated with younger ages of students (lower than 28 years), studying in the second or third year, achieving a high score on the insomnia scale (AIS), achieving a high score on the anxiety and depression subscales (HADS), high intensity of stress related to one's life situation in the last month, and high intensity of clinical and academic stressors.

Depersonalization is significantly associated with male gender, high scores obtained by the student on the depression subscale (HADS), and high levels of stress generated by clinical and academic stressors.

Moreover, low personal accomplishment might more likely affect female students, older rather than younger students, students of Year 3 rather than Year 1, those with

high scores obtained on the depression subscale (HADS), and those who experience high stress due to clinical stressors.

The results regarding the high psychological burden on second-year nursing students in Poland and the factors that predispose them to burnout should be shared among academic nursing lecturers. This knowledge can encourage the academic community to create a more supportive environment for students, ultimately preventing dropouts and increasing the number of nurses in the Polish healthcare system. To address the negative trend of graduates entering the nursing profession, policymakers in Poland should consider extending the duration of undergraduate studies from three to four years, as seen in other countries. Alternatively, they could reduce the number of theoretical and/or practical didactic hours during the course of study. This could be beneficial in reducing student workload and preventing burnout.

It is, therefore, recommended to carry out regular screening tests for burnout, insomnia, and negative emotions such as anxiety, stress, and depression (e.g., once a year). Depending on the results of the tests it should be considered to implement some interventions aiming at reducing the negative outcomes of burnout syndrome (the interventions promoting well-being and adaptive management mechanisms).

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Author contributions
K. S. and W. K., designed research; K. S., W. K., E. M., A. J., I. B., and J. J-P., conducted research; K. S., E. M., A. J., and I. B., analyzed data; K. S., W. K., and E. M., wrote the first draft of the manuscript; K. S., W. K., and J. J-P., had primary responsibility for final content. All authors read and approved the final manuscript.

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Data availability
The data that support the findings of this study are available from Katarzyna Szwamel upon reasonable request.

Declarations

Ethics approval and consent to participate
The research was conducted after receiving consent for the study from The Ethics Committee at the Silesian University of Medicine in Katowice (No 02/KEBN/2022). The research was conducted according to the requirements of the Declaration of Helsinki of 1975 (amended in 2013) and Good Clinical Practice.

Consent for publication
Not applicable.

Clinical trial number
Not applicable.

Statistics
The statistics were checked prior to submission by an expert statistician: Mr Łukasz Deryło, E-mail: lukasz.derylo@gmail.com, https://www.lukaszderylo.pl/. We affirm that the methods used in the data analyses are suitably applied to their data within their study design and context, and the statistical findings have been implemented and interpreted correctly. We agree to take responsibility for ensuring that the choice of statistical approach is appropriate and is conducted and interpreted correctly as a condition to submit to the Journal.

Competing interests
The authors declare no competing interests.

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