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The Effect of Secondary Traumatic Stress and Cognitive Flexibility on Psychological Well-Being in Health Education Students

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Abstract

Aim The aim of this study is to examine the effects of secondary traumatic stress and cognitive flexibility on the psychological well-being of nursing and midwifery students and to model these relationships with machine learning approaches.

Background While nursing and midwifery students are at risk of secondary traumatic stress (STS), cognitive flexibility is an important factor in coping with this stress. This study aims to develop strategies to improve students' mental health by examining the effects of STS and cognitive flexibility on psychological well-being using machine learning methods.

Methods This cross-sectional descriptive study was conducted with 620 nursing and midwifery students between March and August 2024. Data were collected using a Personal Information Form, the Cognitive Flexibility Scale, the Psychological Well-Being Scale, and the Secondary Traumatic Stress Scale. Data analysis was performed using SPSS 22.0, G*Power 3.1, and R programming language 4.1.3.

Results Hierarchical regression estimation showed that the model was significant and usable ($F(2,617) = 112.473$, $p = 0.001$). Secondary traumatic stress level and cognitive flexibility levels together explained 26.7% ($R^2 = 0.267$) of the total variance in psychological well-being. It was determined that the decrease in students' secondary traumatic stress level ($t = -7.724$, $p < 0.001$) and the increase in cognitive flexibility level ($t = 10.755$, $p < 0.001$) caused a statistical increase in the level of "Psychological Well-Being". Shapley Additive Explanations (SHAP) were used to understand the importance and contribution of each variable in the model. Cognitive Flexibility was found to be the most important variable in the prediction of Psychological Well-Being.

Conclusions It was determined that the decrease in the level of secondary traumatic stress and the increase in the level of cognitive flexibility caused an increase in the level of psychological well-being. Longitudinal studies on students' psychological well-being levels are recommended.

Clinical implications This study emphasises the importance of cognitive flexibility strategies to support health education (nurse and midwife) candidates to cope with secondary traumatic stress. It may contribute to the training of healthier and more resilient professionals by increasing the psychological well-being of students in nursing and midwifery education.

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Key Points

- Decreasing secondary traumatic stress increased psychological well-being.
- Cognitive flexibility significantly improved psychological well-being.
- Secondary traumatic stress and cognitive flexibility explained 26.7% of well-being variance.
- Cognitive flexibility was the most important predictor of psychological well-being.

Keywords Midwifery student, Nursing student, Cognitive flexibility, Machine learning, Psychological well-being, Secondary traumatic stress

Introduction

Secondary traumatic stress is defined as an occupational injury that occurs in individuals who support people who have experienced injury by providing direct services [1]. Health professionals directly involved in patient care often witness patients' traumatic experiences, increasing their risk of developing Secondary Traumatic Stress (STS) [2]. It has long been recognised in the literature that STS is a significant problem for healthcare professionals working in the field [3–5]. Nursing students are at high risk of developing STS due to their interactions with traumatized patients during clinical internship periods [6]. Direct or indirect exposure to traumatic events can have far-reaching psychological and physical consequences for the individual [7, 8]. Cognitive flexibility has been identified as one of five key characteristics that help mitigate the psychological and behavioral health impacts associated with traumatic experiences [9].

Cognitive flexibility is of great importance for nursing and midwifery students to develop their ability to cope with complex and stressful situations required by their professional education. Students with high cognitive flexibility can produce various solutions to the problems they face, quickly adapt to different characteristics of patients and changing situations, which increases their self-efficacy and professional success [10, 11]. Furthermore, cognitive flexibility supports students' academic and clinical success by enabling lower stress levels and higher tolerance capacity when faced with uncertainty and stress [12]. These characteristics contribute to nursing and midwifery students to collaborate more effectively in the patient care process, to communicate better with patient relatives and, as a result, to provide better quality health care [13]. Individuals with high cognitive flexibility increase their psychological well-being by regulating their behaviour according to their values and goals and adapting to challenging stimuli [14].

Psychological well-being includes self-acceptance, quality development, strong bonds with others and the ability to cope with prejudices [15]. Psychological well-being can shape not only an individual's temporary feelings, but also their long-term behaviours, beliefs

and coping strategies [15, 16]. Students' psychological well-being is a concern in higher education institutions around the world [17–19]. The university years are an intense transition period for young people, not only academically but also emotionally and socially. During this period, students face many stressful situations such as adapting to a new environment, gaining independence, coping with academic pressures, managing economic difficulties and building social relationships [20–22]. Such transitional periods can directly affect an individual's psychological well-being and cause various adaptation problems [22, 23]. Therefore, it is important to investigate the factors affecting students' psychological well-being in order to support their development as healthier individuals in university life [22].

Especially for nursing and midwifery students, psychological well-being is of great importance due to the high stress and intense workload due to the nature of their professions [24]. In a systematic review, it is stated that continuous exposure to stress may harm individuals' psychological well-being [25]. It is also stated that individuals with good psychological well-being develop a stronger immune system and cope with stress more effectively [26]. Supporting the psychological well-being of students receiving health education such as nursing can positively affect their individual health and make them more successful and productive in their professions [27]. Identifying the factors affecting students' psychological well-being can contribute to the development of targeted interventions and learning strategies [28]. However, before formulating preventive interventions, the relationships between variables related to psychological well-being should be fully understood [29]. The fact that there are no studies examining the psychological well-being level and secondary traumatic stress level of nursing and midwifery students receiving health education together and the limited number of studies in which these two variables are examined together in different sample groups [30], indicate that this issue needs further research.

Therefore, a better understanding of the relationships between variables related to psychological well-being

of nursing/midwifery students receiving health education is of great importance in terms of designing effective interventions. The aim of this study was to examine the effects of secondary traumatic stress and cognitive flexibility on psychological well-being in nursing and midwifery students. This study aims to examine the relationship between secondary traumatic stress and cognitive flexibility with psychological well-being in nursing and midwifery students, thereby contributing to: (a) the development of preventive mental health interventions in clinical training processes, (b) curriculum modifications to enhance students' professional resilience, and (c) addressing the research gap in the literature.

Hypotheses

H1: The level of secondary traumatic stress has a negative effect on psychological well-being in nursing and midwifery students.

H2: Cognitive flexibility level has a positive effect on psychological well-being in nursing and midwifery students.

H3: Cognitive flexibility plays the role of a moderator variable that reduces the effect of secondary traumatic stress on psychological well-being.

Methods

Research design

This study was designed as a descriptive cross-sectional study aimed at exploring the impact of secondary traumatic stress and cognitive flexibility on the psychological well-being of nursing and midwifery students.

Sample and Setting

The population of the study consists of second (2), third (3) and fourth (4) year students studying in the Nursing and Midwifery departments of the Faculty of Health Sciences of a university located in the east of Turkey. There are 709 students (418 nursing, 291 midwifery) studying in the relevant departments (excluding freshmen) in the 2023–2024 education and training period. In the calculation made with the sampling method with known population, it was determined that 249 individuals should be reached. During the data collection process, the responses from the participants were accepted for inclusion in the data analysis according to the eligibility criteria and the study was completed with 620 participants. In the post hoc power analysis performed with the G*Power 3.1 statistical package program in line with the results obtained from these 620 participants, the power of our study was calculated as 99% with a medium effect size at 95% confidence level [31]. The STROBE guidelines were used to report this research paper [32]

Inclusion criteria

Participants were included in the study if they were 2nd, 3rd and 4th year students studying in nursing and midwifery departments, had clinical practice at least one day a week, did not have any psychiatric problems and voluntarily agreed to participate in the study.

Exclusion criteria

The study excluded first-year nursing and midwifery students who had psychiatric disorders (including major depressive disorder, generalized anxiety disorder, panic disorder, social phobia, or ADHD) and those who did not agree to participate in the research.

Data collection

In this study, data were collected through face-to-face interviews using the "Personal Information Form," "Cognitive Flexibility Scale," "Psychological Well-Being Scale," and "Secondary Traumatic Stress Scale." The dependent variable was identified as psychological well-being, while the independent variables were secondary traumatic stress and cognitive flexibility. These variables were assessed using the "Psychological Well-Being Scale," "Secondary Traumatic Stress Scale," and "Cognitive Flexibility Scale," and the effects on the psychological well-being of nursing and midwifery students were analyzed.

Personal information form

The personal information form prepared by the researchers in line with the literature consists of questions about gender, age, department, grade level, clinical practice and how has exposure to disaster/war-related content on digital platforms affected your perception of the nursing/midwifery profession [13, 33, 34].

Cognitive Flexibility Inventory

The Cognitive Flexibility Inventory (CRI) developed by Dennis and Vander Wall, and adapted into Turkish by Gülüm and Dağ in 2012 was used to assess the cognitive flexibility levels of the participants. BEI consists of 20 items [35, 36]. It consists of two sub-dimensions: "Alternatives" and "Control". Cronbach's Alpha internal consistency coefficient was calculated as 0.90 for the whole inventory, 0.89 for Alternatives and 0.85 for Control. The BEI was prepared in a 5-point Likert scale (1 not at all appropriate-5 completely appropriate) to be applied to adults. 2, 4, 7, 9, 11 and 17 are reverse items of the inventory. The higher the score obtained from the inventory, the higher the level of cognitive flexibility [36]. In this

study, Cronbach's alpha value of the scale was found to be 0.68.

Psychological Well-Being Scale

The scale was developed by Diener et al. in 2009 to measure socio-psychological well-being as a complement to existing measures of well-being [37]. It was stated that the Cronbach alpha coefficient of the scale was 0.87. The adaptation study of the scale into Turkish was conducted by Telef (2013) and the Cronbach alpha coefficient was found to be 0.80 [38]. The scale has one sub-dimension and consists of eight items. The items of the Psychological Well-Being Scale are answered between 1–7 in the form of strongly disagree (1) to strongly agree (7). All items in the scale are expressed positively. Scores vary between 8 and 56. A high score indicates that the person has psychological resources and strength [38]. In this study, Cronbach's alpha value of the scale was found to be 0.85.

Secondary Traumatic Stress Scale

Scale was first developed by Bride et al. to investigate the stressful situations experienced by social workers working in child protection services [39]. The Turkish validity and reliability study of the scale was conducted by Yıldırım et al. [40]. The STS is a 5-point Likert-type scale consisting of 17 items. It was developed to measure the stress symptoms of professionals working with people who have experienced traumatic events. The minimum score that can be obtained from the scale is 17 and the maximum score is 85. A high total score on the scale was considered to indicate that secondary traumatic stress may also be high. The responses to the statements asked in the scale are 1 (never), 2 (very rarely), 3 (occasionally), 4 (frequently), 5 (very frequently). The scale has three sub-dimensions: avoidance, emotional violation and arousal. Questions 1, 5, 7, 9, 12, 14 and 17 of the scale include avoidance sub-dimension, questions 4, 8, 11, 15 and 16 include arousal sub-dimension and questions 2, 3, 6, 10 and 13 include emotional violation sub-dimension. Cronbach's alpha reliability coefficient of the scale is $\alpha = 0.91$ [40]. In this study, Cronbach's alpha value of the scale was found to be 0.87.

Data analysis

The data obtained in this study were analyzed using SPSS statistical program (SPSS-22). It is stated that if the Skewness and Kurtosis values are between -1.5 and $+1.5$, the data can be accepted as normally distributed [41]. Hierarchical regression analysis is a statistical method that examines the effect of one or more independent variables on a dependent variable in a stepwise manner. This type of analysis is particularly useful for understanding and

interpreting complex models. In this study, the dependent variable was analyzed with a hierarchical regression model for prediction.

Using R programming language version 4.3.1, various machine learning and deep learning algorithms (KNN, SVM (svmRadialSigma), artificial neural networks (avN-Net, monmlp, neuralnet, pcaNNet), RF (rf), XGBoost (xgbLinear) and alternative regression methods (Ridge, Lasso, Elastic Net)) were applied through caret package. For each algorithm, hyperparameter optimization was performed to maximize the overall performance of the model. Traditional statistical methods (e.g. regression analysis) are highly effective in modeling linear relationships and inferring parameter significance. However, the current dataset exhibits complex, non-linear patterns and high-dimensional interactions that are better captured by ML models [42].

Ethical considerations

The study was approved by Muş Alparslan University Scientific Research and Publication Ethics Committee (Date and Number: 07.03.2024–134691). After ethical approval, institutional permission (Date and Number: 21.03.2024–506507) was obtained from Van Yüzüncü Yıl University Faculty of Health Sciences, where the study will be conducted. Participants were informed in detail about the purpose and method of the study and the time required for participation. It was also emphasised that participation would not cause any harm and was completely voluntary. Verbal and written informed consent was obtained from the participants. The Helsinki Declaration of Human Rights was adhered to and the protection of individual rights was prioritised.

Findings

In this study, 79.0% of participants were female, 65.0% were nursing students, and 36.1% were in their 2nd year. While 76.3% expressed a desire to work as nurses/midwives in the future, 59.4% reported not encountering any traumatic events during clinical practice. Notably, 45.6% of participants stated that digital content related to natural disasters or wars negatively affected their perception of the profession. The mean age of students was 21.89 ± 1.63 years (Table 1).

When the results of the analysis of the hierarchical regression models to reveal the effects of Secondary Traumatic Stress level and Cognitive Flexibility Level on Psychological Well-Being level are examined, 95,0% Confidence Interval for B;

Statistical estimates for Model 1 show that the model is significant and usable ($F(1,618) = 92.172$, $p = 0.001$). The level of Secondary Traumatic Stress explained 13.0% of the total variance of Psychological Well-Being (R^2

Table 1 Descriptive Characteristics of Individuals (n = 620)

Demographic Characteristics		n	%
Gender	Male	130	21.0
	Female	490	79.0
Department of Study	Nursing	403	65.0
	Midwifery	217	35.0
Class of Study	Grade 2	224	36.1
	Grade 3	193	31.1
	Grade 4	203	32.8
Desire to work as a nurse/midwife in the future	Yes	473	76.3
	No	147	23.7
Encountering any traumatic event during clinical practice	Yes	252	40.6
	No	368	59.4
How has exposure to disaster/war-related content on digital platforms affected your perception of the nursing/midwifery profession?	Positive impact	235	37.9
	Negative impact	283	45.6
	Does Not Affect	102	16.5
Age (Years)	$\bar{X} \pm SD$ (Min–Max)	21.89 $\pm$ 1.63 (19–37)	

=0.130). In the regression model, when the t-test results regarding the significance of the regression coefficient were analyzed; it was determined that the decrease in the participants' Secondary Traumatic Stress level ($t = -9.601$, $p < 0.001$) caused a statistical increase in the level of "Psychological Well-Being" (Table 2).

Statistical estimates for Model 2 show that the model is significant and usable ($F(2,617) = 112.473$, $p = 0.001$). Secondary Traumatic Stress and Cognitive Resilience levels together explain 26.7% ($R^2 = 0.267$) of the total variance in Psychological Well-Being. In the regression model, when the t-test results regarding the

significance of the regression coefficient were examined; it was determined that the decrease in the level of Secondary Traumatic Stress ($t = -7.724$, $p < 0.001$) and the increase in the level of Cognitive Flexibility ($t = 10.755$, $p < 0.001$) caused a statistical increase in the level of "Psychological Well-Being". According to the model, Secondary Traumatic Stress and cognitive flexibility together predict psychological well-being better (Table 2).

Algorithms for Psychological Well-being prediction and the determination of the best hyperparameters based on logarithmized training data are given in Fig. 1.

Table 2 Hierarchical Regression Analysis Results to Determine the Effect of Secondary Traumatic Stress Level and Cognitive Flexibility Level on Psychological Well-Being (n = 620)

Predictive Variables	Psychological Well-Being Scale (Dependent variable)					
	B	SD	β	t	p*	95.0% Confidence Interval for B
Model 1						Lower Bound Upper Bound
(Constant)	53.459	1.279		41.810	0.001	50.948 55.970
Secondary Traumatic Stress	-0.272	0.028	-0.360	-9.601	0.001	-0.328 -0.217
Model 2						
(Constant)	18.762	3.433		5.465	0.001	12.020 25.504
Secondary Traumatic Stress	-0.207	0.027	-0.273	-7.724	0.001	-0.259 -0.154
Cognitive Flexibility	0.467	0.043	0.381	10.755	0.001	0.381 0.552
R	Model 1: 0.360 Model 2: 0.517					
R ² /Adjusted R ²	Model 1: 0.130/0.128 Model 2: 0.267/0.265					
R ² Change	Model 1: 0.130 Model 2: 0.137					
F	Model 1: 92.172 Model 2: 112.473					

Hierarchical Regression Analysis*

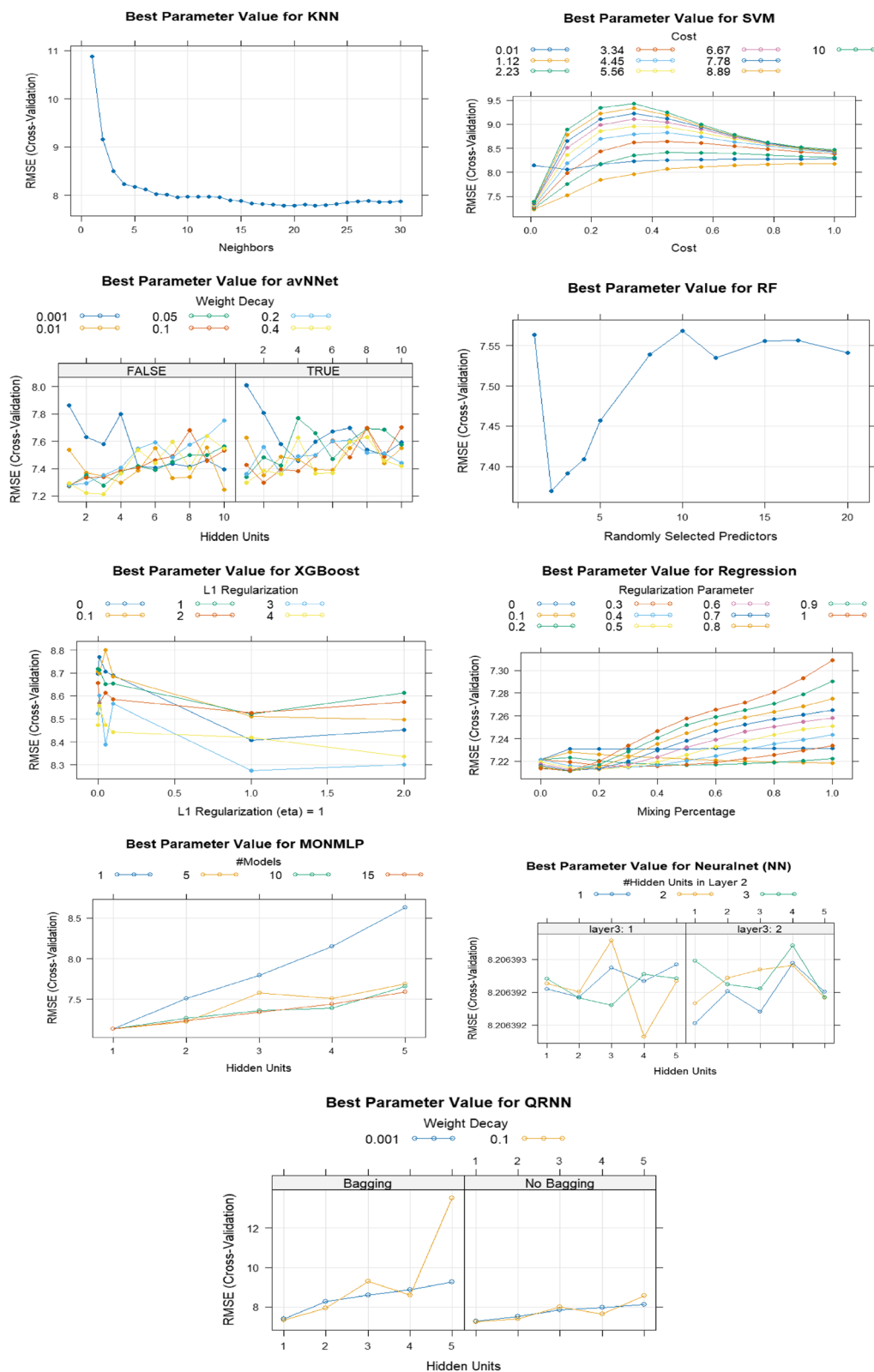


Fig. 1 Algorithms for Psychological Well-Being prediction and determination of the best hyperparameters based on logarithmized train data

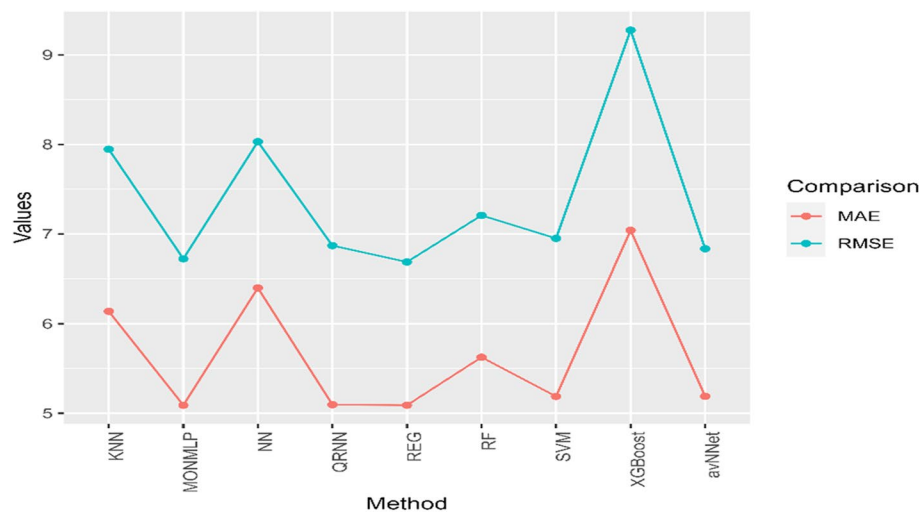


Fig. 2 Metric values corresponding to the prediction of the test data obtained by inverse transformation of the most accurate models according to the hyperparameter values

When the RMSE and MAE values in Fig. 2 are analyzed, the test prediction results of these most successful hyperparameters are obtained. It is seen that the MONMLP method gives the most accurate result (Fig. 2).

The prediction performance of the model on the test data is shown in Fig. 3. In this figure, the model's predictions are represented by the red lines, while the actual test data is represented by the blue lines (Fig. 3).

Shapley Additive Explanations (SHAP) were used to understand the importance and contribution of each variable in the model. Cognitive Flexibility was found to be the most important variable in the prediction of Psychological Well-Being (Fig. 4).

Psychological Well-Being has a negative and average strength relationship with Secondary Traumatic Stress variable, a positive and not average strength relationship with Cognitive Flexibility variable, and a negative and not

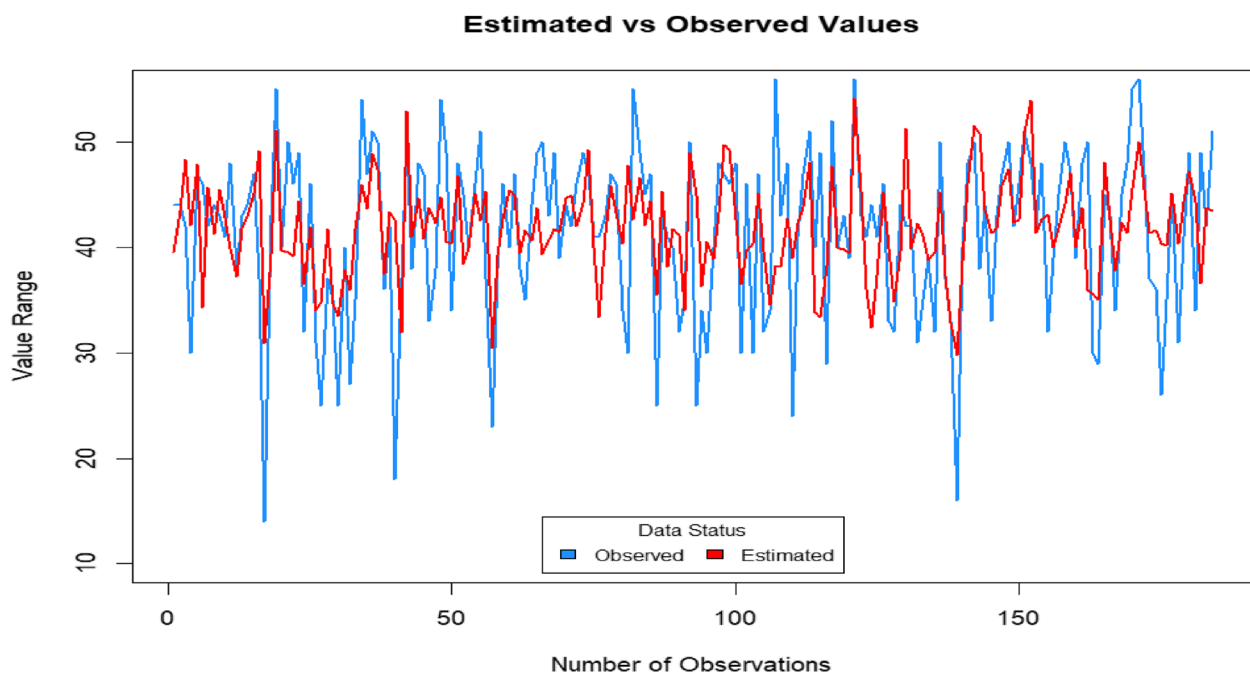


Fig. 3 Psychological Well-Being Test Data Prediction with MONMLP Method

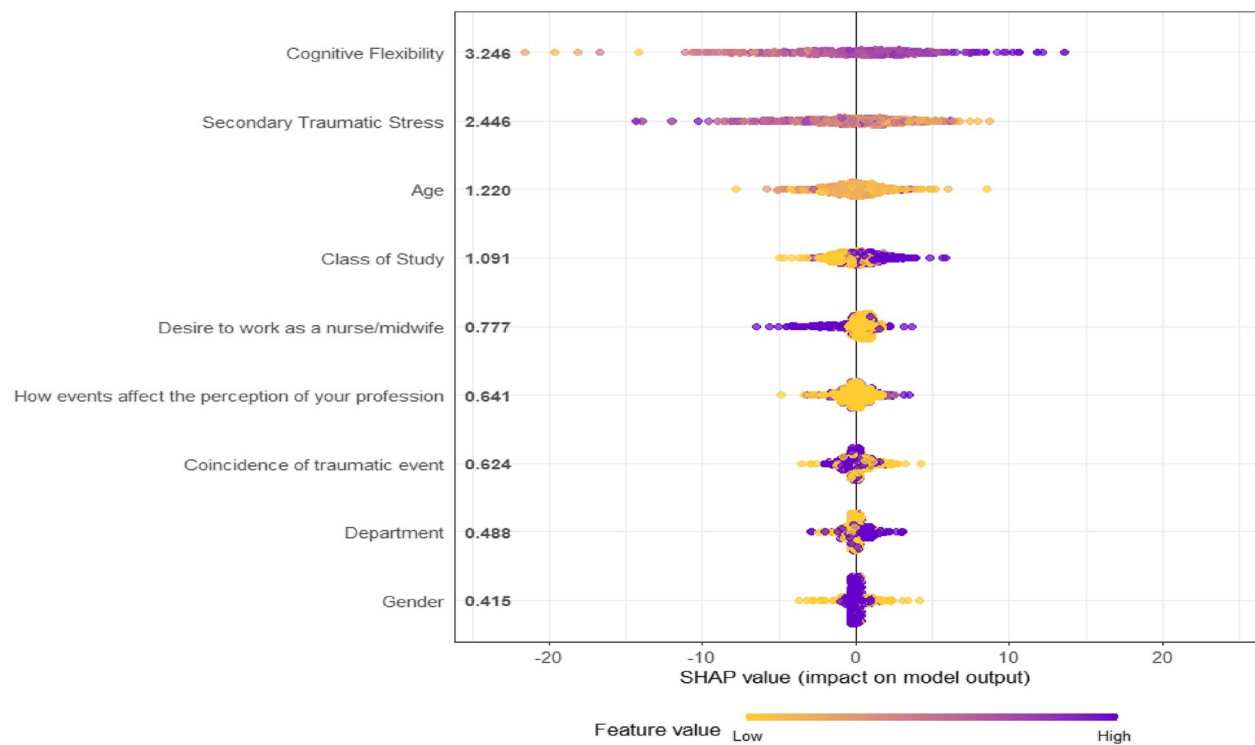


Fig. 4 Determining the contribution of variables to the model for Psychological Well-Being prediction with Shapley values

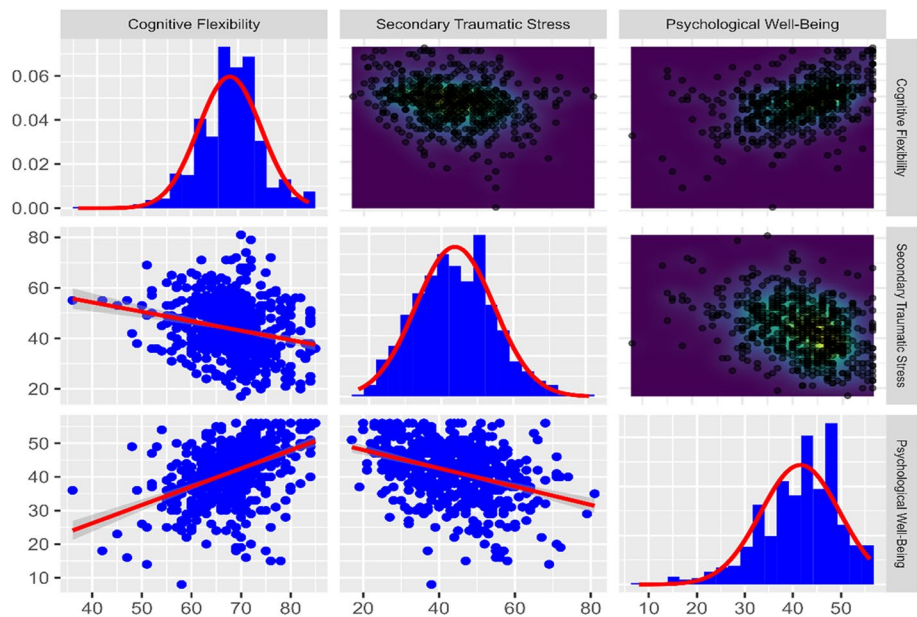


Fig. 5 Distribution, Interaction and Density graph of Psychological Well-Being, Secondary Traumatic Stress and Cognitive Flexibility variables

strong relationship between Secondary Traumatic Stress and Cognitive Flexibility variable. In addition, the relationship between all variables is statistically significant (Fig. 4).

Figure 5 shows the interaction between Psychological Well-Being, Secondary Traumatic Stress and Cognitive Flexibility (Fig. 5). It was determined that the decrease in the level of Secondary Traumatic Stress and the increase in the level of “Cognitive Flexibility” caused a statistical increase in the level of “Psychological Well-Being” (Fig. 5).

Discussion

The aim of this study is to examine the relationship between Secondary Traumatic Stress (STS) and Cognitive Flexibility (CR) affecting the Psychological Well-Being of nursing and midwifery students. The results of the analysis show that there is a significant relationship between the decrease in the level of Secondary Traumatic Stress and Psychological Well-Being. In addition, an increase in the level of Cognitive Flexibility also increases Psychological Well-Being. According to the multiple regression analysis, STS and BE together explain 26.7% of Psychological Well-Being. These findings reveal that STS and CB have a significant effect on Psychological Well-being and together they predict this relationship better. SHAP analysis results show that Cognitive Flexibility is the variable with the strongest effect on Psychological Well-Being. The study emphasises that STS and BE have a significant effect on Psychological Well-being and that these variables interact with each other. The findings of the study confirm our hypotheses.

Understanding the factors influencing professional commitment among nursing students is crucial for supporting their long-term retention in the nursing profession after graduation [43]. This study found that the majority of participating students (59.4%) had not encountered any traumatic incidents during clinical practice, yet exposure to disaster- or war-related content on digital platforms negatively affected their perceptions of the profession (45.6%). This suggests that students’ professional identity is still in its early developmental stages, and their awareness of potential future occupational challenges may be limited. Several studies support this finding [44–46]. Additionally, students’ reports that traumatic media content (e.g., disasters and wars) negatively influenced their perception of the profession highlight the impact of indirect traumatization on professional attitudes. Stress is known to be prevalent in nursing and midwifery education, particularly in clinical and academic settings [24]. Chronic exposure to such stress may adversely affect students’ psychological well-being, impairing not only

their academic performance but also weakening their professional commitment [47]. These findings collectively emphasize the need for a holistic approach in educational processes, considering both clinical and digital traumatic experiences to foster professional commitment and identity development.

This study found that a decrease in STS levels led to an increase in individuals’ Psychological Well-Being (PWB). This result indicates that reducing traumatic stress is a significant factor in enhancing psychological well-being. Morales-Rodríguez et al. (2020) emphasize that identifying factors influencing psychological well-being plays a critical role in developing targeted interventions and learning strategies [28]. A systematic review highlights that prolonged exposure to stress can harm individuals’ psychological well-being [25]. This study is particularly noteworthy as it reveals a strong and significant relationship between STS and PWB, especially among groups frequently exposed to trauma, such as nursing and midwifery students. A comprehensive literature review found no studies directly examining the relationship between secondary traumatic stress and psychological well-being specifically among nursing and midwifery students. However, research involving other sample groups has explored these two variables together, providing valuable insights in the field. For instance, studies conducted with healthcare workers [48], humanitarian health workers in Northwestern Nigeria [49], and social workers in Namibia [30] have identified significant negative correlations between STS and PWB. Additionally, a study with nursing students found a positive relationship between resilience and psychological well-being [50], while another study reported a negative correlation between STS and resilience [51]. STS is often regarded as a consequence of unresolved compassion fatigue [52]. Indeed, an investigation involving undergraduate health sciences students demonstrated a negative correlation between compassion fatigue and psychological well-being [53]. When these findings are considered collectively, it can be inferred that STS may have an indirect adverse effect on psychological well-being. This observation aligns with and supports the results of the present study, demonstrating consistency with the existing literature.

This study demonstrates that cognitive flexibility has a significant impact on individuals’ psychological well-being. By enabling individuals to regulate their behaviors not only based on internal experiences but also in alignment with their values and goals, cognitive flexibility emerges as a key factor in enhancing well-being [14]. A comprehensive literature review revealed no studies directly examining the relationship between cognitive flexibility and psychological well-being specifically

among nursing and midwifery students. However, research involving other sample groups has explored these variables together, providing valuable insights in this field. For instance, studies conducted with university students in Turkey have identified a positive and significant correlation between cognitive flexibility and psychological well-being [54, 55]. Similarly, studies involving adolescents have found a positive and significant relationship between cognitive flexibility and psychological well-being [56, 57]. A study of nurses showed that cognitive flexibility plays a mediating role in the relationship between work-related stress and psychological well-being, thus strengthening overall resilience [58]. Additionally, research indicates that students with higher cognitive flexibility cope more effectively with challenges and, consequently, exhibit greater psychological well-being [14, 59, 60]. These findings suggest that interventions aimed at enhancing cognitive flexibility may significantly contribute to improving well-being and fostering resilience in the face of adversity. Multifaceted skills that constitute cognitive flexibility, along with training programs that promote adaptive behaviors, play a critical role in the effectiveness of cognitive training programs in real-world settings, such as educational and clinical environments [61]. One study found that a mindfulness-based cognitive therapy program effectively increased cognitive flexibility among nursing students [62], while another study demonstrated that transactional analysis training improved cognitive flexibility in nursing students [11]. This study's findings support existing literature by confirming the positive link between cognitive flexibility and psychological well-being. In this context, students' ability to adapt to the demands of clinical settings, effectively utilize cognitive flexibility skills, and functionally engage in the professional learning process may have contributed to these outcomes. Targeted training programs designed to enhance cognitive flexibility could thus serve as valuable tools in fostering psychological well-being and professional adaptability among nursing and midwifery students.

Clinical implications

Our study shows that secondary traumatic stress has a negative effect on nursing and midwifery students' psychological well-being and cognitive flexibility can improve this situation. Therefore, it is necessary to observe the effect of secondary traumatic stress and cognitive flexibility on the psychological well-being of nursing and midwifery students. In clinical settings, when students are exposed to traumatic experiences, managing secondary traumatic stress may alleviate emotional burden and lead to better mental health. Furthermore, promoting cognitive flexibility helps students to adapt to

clinical challenges, manage stress more effectively, and improve problem-solving skills. In clinical practice, the effects of secondary traumatic stress should be monitored and appropriate support mechanisms should be put in place when necessary to improve students' psychological well-being.

Limitations

Cross-sectional studies cannot determine cause-effect relationships since the data are collected at the same time. Therefore, this study is limited to identifying relationships and trends that exist at a particular point in time rather than establishing causality. Another limitation is that the study is based on self-report data, which may be subject to biases such as social desirability or recall bias. Furthermore, the sample consisted only of nursing and midwifery students, which may limit the generalisability of the findings to other populations or occupational groups. Although the study sample was large enough ($n = 620$), the fact that the data was collected only from a single university located in eastern Turkey limits the generalizability of the findings to different cultural and institutional settings. Therefore, it is recommended that future research collect data from various geographical regions and types of institutions to assess whether the results are valid in different sociocultural contexts. In particular, how contextual factors such as cultural structure, social values and educational systems affect variables such as psychological well-being and cognitive flexibility should be examined in depth in future studies.

Conclusion and Recommendations

This study revealed that 45.6% of nursing and midwifery students reported their professional perceptions were negatively affected by digital content related to natural disasters or wars, while 59.4% did not encounter traumatic events during clinical practice. Hierarchical regression analyses demonstrated that decreased secondary traumatic stress and increased cognitive flexibility significantly predicted psychological well-being ($R^2 = 26.7\%$, $p < 0.001$). SHAP analysis identified cognitive flexibility as the most important predictor, and MONMLP modeling showed high predictive performance. The findings suggest that interventions enhancing cognitive flexibility and trauma management programs in health education could potentially improve psychological well-being. These results highlight the importance of addressing both psychological stressors and resilience factors in nursing and midwifery education to promote students' mental health.

It is highly feasible to integrate structured psycho-educational programs specifically aimed at improving cognitive flexibility into nursing and midwifery

curricula. These programs can be implemented in the following ways:

- Short-term modules (e.g. hands-on workshops lasting 4–6 weeks) can focus on topics such as problem solving, alternative thinking, stress management and emotional resilience.
- These modules can be integrated with clinical skills training to help students develop flexible thinking skills through real-life scenarios.
- In addition, mentoring and peer support networks can also play a critical role in this process:

Mentoring programs conducted by experienced nurses or academics during clinical practice periods can increase students' capacity to cope with traumatic situations. Peer support groups can strengthen psychological resilience and flexibility through sharing and emotional support. Such social support structures may be more effective when implemented in combination with individual interventions.

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Authors' contributions

Conceptualization: Y.S., E.K., Ö.S., M.Y., D.K., N.Ç., S.S.; Methodology: Y.S., E.K., Ö.S., M.Y.; Software: Y.S., E.K., M.Y.; Validation: Y.S., Ö.S.; Investigation: Y.S., E.K., Ö.S.; Resources: M.Y.; Data curation: Y.S., D.K., S.S.; Writing – original draft preparation: Y.S., E.K., Ö.S., M.Y., N.Ç.; Writing – review and editing: Y.S., E.K., Ö.S., M.Y., D.K., N.Ç., S.S.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

The study was approved by Muş Alparslan University Scientific Research and Publication Ethics Committee (Date and Number: 07.03.2024–134691). After ethical approval, institutional permission (Date and Number: 21.03.2024–506507) was obtained from Van Yüzüncü Yıl University Faculty of Health Sciences, where the study will be conducted. Participants were informed in detail about the purpose and method of the study and the time required for participation. It was also emphasised that participation would not cause any harm and was completely voluntary. Verbal and written consent was obtained from the participants. The Helsinki Declaration of Human Rights was adhered to and the protection of individual rights was prioritised.

Consent for publication

All authors have given their consent for publication.

Competing interests

The authors declare no competing interests.

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