PRIMENJENA PSIHOLOGIJA

No1, 2026

Contents

Primenjena psihologija
Vol. 19, No. 1, pp. 3–27, 2026

Research Article

Predicting Elementary School GPA Using Machine Learning Approaches

Ivana Isailović[1]✉, Isidora Gatarić[1], and Ilija Milovanović[1]

[1]*Department of Psychology, Faculty of Philosophy, University of Novi Sad, Serbia*

ABSTRACT

Predicting academic success, quantified as Grade Point Average (GPA), is one of the key research focuses in educational psychology, with ongoing debate regarding the most influential predictors. Previous studies suggest that cognitive readiness for school (e.g., attention, working memory, etc.) is among the strongest predictors of later academic achievement. In addition, social factors such as parents' education and gender also show consistent, though somewhat weaker, associations with GPA. However, many earlier studies have relied on traditional statistical models, such as linear regression, which assume linearity and often overlook complex, nonlinear interactions among variables. This limits their ability to uncover the true structure of influential predictors. In contrast, advanced machine learning (ML) methods, such as decision trees, random forest, and gradient boosting, can model such complexity, offering greater accuracy and deeper insight into predictor importance. This study applied these ML algorithms, along with linear regression, to predict GPA in 4th and 7th grade among 218 elementary school students, using measures of cognitive readiness and socio-demographic variables as predictors. Results indicated that linear regression and random forest yielded the most accurate predictions. The strongest predictors of GPA in both grades were measures of cognitive readiness (*Coding*, *Visual Memory*, *General Knowledge*, *Block Assembly*), while other predictors had minimal or no effect. These findings underscore the value of ML models in improving early identification of at-risk students and informing targeted academic support, while also illustrating the contexts in which traditional methods may still perform comparably.

Keywords: elementary school GPA, decision trees, random forest, gradient boosting, cognitive readiness for school

UDK: 37.015.3
DOI: 10.19090/pp.v19i1.2625
Received: 09.04.2025.
Revised: 14.06.2025.
Accepted: 14.07.2025.

✉ Corresponding author's email: ivana.strizovic@gmail.com

Introduction

Grade Point Average (GPA) is widely recognized as a key measure of academic achievement at all levels of education. It is frequently used to evaluate a student's readiness for future educational and career opportunities (Imose & Barber, 2015). Studies have demonstrated that students with lower GPAs are more likely to face challenges in high school and beyond, including lower graduation rates and limited post-secondary education opportunities (e.g., Tyler & Lofstrom, 2009). Lower academic performance during this period is also associated with an increased risk of dropping out of formal education, which can have lasting adverse effects on an individual's career trajectory and socioeconomic status (Entwisle et al., 2005; Lawson et al., 2020). Given its critical role in long-term academic success, predicting GPA in elementary school provides valuable insights into early academic performance and potential future career outcomes (Entwisle et al., 2005; Lawson et al., 2020). Understanding GPA predictions involves examining the complex interplay of individual and contextual factors, such as cognitive abilities, socioeconomic background, and parental involvement, which collectively shape academic performance (Eccles & Roeser, 2011).

Cognitive determinants of GPA

A growing body of research highlights the critical role of cognitive readiness for elementary school, defined as a child's ability to engage in and benefit from classroom learning (Blair, 2002), in shaping long-term academic success. Key components such as verbal and visuospatial working memory (Bull et al., 2008; Soltanlou et al., 2019) and numerical representations (Stock et al., 2009) are consistently identified as robust predictors of achievement (Duncan et al., 2006; Jovanović et al., 2010; McClelland et al., 2017). Among them, early math and logical abilities are the strongest determinants of later performance, followed by reading skills and attentional control (Duncan et al., 2006). Soltanlou et al. (2019) found that children with superior working memory capacities achieve higher GPAs across subjects, highlighting the role of these faculties in learning, problem-solving, and retention. Although much of the research originates from Western cultures, similar findings were reported in Serbia (e.g., Jovanović et al., 2010). In Serbia, the most commonly used tools for assessing school readiness are the *New*

Belgrade Revision of the Binet-Simon Scale (Ivić et al., 1976) and *the First Grader Examination Test* (Ivić et al., 1995). More recently, *the School Maturity Test* (Novović et al., 2007) has gained popularity. It assesses memory, attention, visuomotor coordination, practical knowledge, and social adjustment. Its advantage lies in minimizing cultural, social, and linguistic bias, making it a reliable and valid cognitive measure (Biro et al., 2006; Jovanović et al., 2010).

Socio-economics, parental actors, and GPA prediction

Beyond cognitive abilities, socioeconomic status (SES) is a major determinant of academic performance. Research consistently demonstrates that students from higher-income families tend to have greater access to high-quality educational resources, including well-funded schools, private tutoring, and enrichment programs that foster cognitive and academic growth (Sirin, 2005). These advantages create cumulative effects that reinforce achievement gaps (Reardon, 2018). A key SES component is parental education, a strong predictor of student success. Educated parents often provide cognitive stimulation, academic support, and emphasize the value of education (Davis-Kean, 2005; Li et al., 2024; Tamayo Martinez et al., 2022). They are also better equipped to navigate the education system and secure opportunities such as advanced coursework (Lareau, 2018). Furthermore, students whose parents set high expectations, monitor homework, and engage with schools typically earn higher GPAs and test scores (Fan & Chen, 2001; Li et al., 2024; Naite, 2021). Moreover, previous research shows that the supportive, autonomy-granting parenting positively affects children's academic performances (Bucci Liddy et al., 2021; Jeynes, 2007).

Machine learning algorithms and GPA prediction

While prior research has identified GPA determinants (Imose & Barber, 2015; Li et al., 2024; Soltanlou et al., 2019), most relied on traditional statistical methods, such as regression analysis, which often miss the complexity and non-linearity of influencing factors. Recent advancements in machine learning (ML) have addressed these limitations, enabling researchers to use more sophisticated predictive models that account for

complex interactions between multiple predictors (Burke & Sass, 2013). ML approaches, particularly decision trees (DT), random forest (RF), and gradient boosting (GB), have demonstrated superior accuracy in GPA prediction compared to conventional statistical models (Zhang et al., 2020). These ML techniques provide distinct advantages over traditional regression models by uncovering hidden patterns in student performance data, facilitating early interventions, and improving educational decision-making (Baker & Inventado, 2014). By leveraging these models for GPA prediction, researchers can generate more precise predictions and develop targeted support strategies for at-risk students. Advanced techniques, such as deep learning and support vector machines, are often mentioned in GPA prediction. While deep learning models achieve high accuracy, they require large datasets and lack transparency, making them less suitable for educational policy applications where explainability is crucial (Lipton, 2016). Similarly, support vector machines, though effective for classification, are computationally demanding and less interpretable, especially in large, multi-dimensional datasets (Vapnik, 1995). Given these limitations, DT, RF, and GB are more suitable for GPA prediction in real-world educational datasets of limited size.

Accurate GPA prediction using ML has significant implications for policy, instruction, and support systems. Early identification of at-risk students enables targeted interventions, resource allocation, and personalized instruction (D'Mello & Graesser, 2012). International studies confirm ML's effectiveness in predicting achievement, using demographic, cognitive, and behavioral data. Cognitive abilities emerge as the most reliable predictors, followed by SES (Chen & Ding, 2023; Ojajuni et al., 2021; Rajendran et al., 2022). In Serbia, research on the application of ML in education is still in its early stages, with a handful of studies focusing on high school and college students (Gerasimović, 2012; Stanković, 2021). Gerasimović (2012) demonstrated that socioeconomic status and prior academic achievement can be successfully used to predict students' college choices. Stanković (2021) further explored ML applications in education, showing that student engagement metrics and assessment patterns can effectively predict academic success in higher education.

The present study

The review of the available literature suggests there is a notable research gap in exploring how early predictors (e.g., cognitive abilities, SES, etc.) contribute to GPA outcomes in elementary school. The present study aims to address this gap by evaluating the predictive performance of linear regression, DT, RF, and GB in predicting 4th and 7th – grade GPA, based on cognitive, demographic, and socioeconomic variables.

The decision to focus on these grades is grounded in key developmental and educational transitions that occur at these stages. Fourth grade marks a shift from basic skill acquisition to their application across subjects, requiring more cognitive flexibility and independence (Mullis et al., 2012). In Serbia, the fourth grade is also important as it marks the end of the first educational cycle, after which students transition from being taught by a single teacher to subject-specific teachers. Seventh grade coincides with early adolescence and greater academic complexity (Eccles & Roeser, 2011). In the Serbian educational system, a broader curriculum, including physics, chemistry, and a second foreign language, is introduced in the seventh grade, demanding cross-disciplinary integration and increasing cognitive load.

While linear regression is a foundational and widely used predictive model in educational research, it imposes certain statistical assumptions, such as linearity, homoscedasticity, and lack of multicollinearity, that are often violated in real-world educational data (Kutner et al., 2005). More flexible ML algorithms, such as RF, DT, and GB, are designed to accommodate nonlinearity, interaction effects, and complex, high-dimensional feature spaces without relying on these assumptions (Fernández-Delgado et al., 2014; Zhang et al., 2020). These models can better capture the multifaceted and nonlinear nature of educational performance, offering improved generalization, robustness to overfitting, and enhanced interpretability through tools like variable importance measures.

Importantly, this study does not frame linear regression and modern ensemble-based methods as belonging to entirely separate analytical paradigms. Rather, all models applied in this study fall within the broader domain of supervised ML. However, their methodological capacities differ significantly. Linear regression represents a simpler, parametric approach,

while ensemble models offer more adaptive, data-driven learning mechanisms capable of modeling complex relationships. Emphasizing these distinctions is essential for understanding the potential added value that newer ML approaches bring to educational prediction tasks (Smith & Lee, 2022).

Building on the findings of previous studies (e.g., Zhang et al., 2020), our study aims to compare predictive performance across models and identify the variables that most strongly contribute to GPA, thereby providing both theoretical and practical contributions. It is expected that ensemble methods, particularly RF, will yield superior predictive performance due to their ability to manage noisy, high-dimensional data and uncover non-obvious patterns. Additionally, cognitive readiness and SES-related variables, such as parental education and academic expectations, are hypothesized to emerge as key predictors. Through this comparative approach, the study aims to offer a nuanced perspective on the utility of different supervised ML models in educational research and to provide a foundation for their future integration into data-informed educational decision-making.

Method

Sample and procedure

This study involved 218 primary school students from Stara Pazova (112 male, 106 female), all native Serbian speakers, aged 13–14 years (M = 13.39, SD = 0.49). Data collection spanned three phases over approximately seven years. In the first phase, a certified school psychologist or pedagogue conducted cognitive and developmental assessments during the students' final preschool year, alongside a parental sociodemographic questionnaire. Academic performance data for 4th and 7th grades were obtained from school records. The 7th grade data were collected prospectively, while 4th grade GPA data were retrieved retrospectively.

In Serbia, preschool cognitive testing is required for school enrollment. Parents provided formal applications and signed informed consent forms permitting scientific use of their children’s data. The study adhered to strict ethical standards, ensuring anonymity and confidentiality.

Due to consent restrictions, the dataset is not publicly available but may be accessed upon reasonable request and additional ethical approval.

Instruments and measures

The School Maturity Test

The School Maturity Test (Novović et al., 2007) includes five subtests assessing children's cognitive and developmental abilities. *General Knowledge* evaluates practical knowledge and social adaptability, aiming to reduce socio-educational bias. *Visual Memory* measures retention and attention. *Block Assembly* tests visuomotor coordination, organization, and planning, and *Coding* assesses coordination, learning, and concentration. Lastly, the *Visual Vocabulary* subtest assesses linguistic competence and serves as an alternative measure specifically designed for children from socially disadvantaged backgrounds or those whose native language is not Serbian. Since the sample did not include children from such categories, the *Visual Vocabulary* test was not included in this study. In previous research, the reliability coefficients for the subtests of the School Maturity Test are as follows: *General Knowledge* (.52), *Visual Memory* (.80), *Block Assembly* (.82), and *Visual Vocabulary* (.77), while the overall reliability is .87 when including the *Visual Vocabulary* subtest and .85 when excluding it (Novović et al., 2007).

The Sociodemographic Questionnaire for Parents

The Sociodemographic Questionnaire for Parents gathered data on parental and household characteristics, including age, education, employment type, financial status, and involvement in the child's learning. Parental perceptions of the child's academic potential and school interest were assessed using two single-item questions, asking parents to rate their child's expected academic performance (satisfactory to outstanding) and to indicate whether they believe their child is interested in school.

The Student Data Questionnaire

The Student Data Questionnaire, developed for the purposes of this study, included questions about the student's gender and age, as well as tasks aimed at assessing cognitive and developmental indicators. *Spatial orientation* was assessed through a task that required students to identify

positions of objects relative to each other and follow spatial instructions. *Temporal orientation* was measured using sequencing tasks that required students to place daily activities in chronological order and interpret time-related concepts. *Word analysis and synthesis skills* were evaluated through phonological tasks involving breaking down words into individual phonemes (analysis) and combining phonemes into meaningful words (synthesis). Additionally, the questionnaire included questions about the student's GPA at the end of the 4th and 7th grades, as reported by school records.

Statistical methods

Descriptive statistics were first computed to summarize information about the dataset. Subsequently, linear regression, DT regressor, RF regressor, and GB regressor were applied to predict GPA. The DT regressor partitions the data using recursive binary splits, assigning each region the mean value of the target variable (Breiman et al., 1984). RF improves predictive accuracy and reduces overfitting by aggregating the outputs of multiple trees trained on bootstrapped samples and random subsets of features (Breiman, 2001). GB builds trees sequentially, with each tree correcting the residual errors of its predecessors through gradient-based optimization (Friedman, 2001). These models were selected to represent a progression in complexity and predictive power, enabling a comprehensive comparison in terms of performance, interpretability, and generalization ability.

All analyses were performed in *Python 3* (Van Rossum & Drake, 2009) using the *Jupyter Notebook* environment. The *Pandas 2.2.3 package* (McKinney, 2010) was used for descriptive statistics, while *Matplotlib* (Hunter, 2007) was used for data visualization.

Results

As the dataset contained no missing values nor measurement errors, descriptive statistical analysis was performed (Table 1).

Table 1

*The Results of Descriptive Statistical Analysis (*N = *218)*

Variables	*M*	*SD*	*Min*	*Skewness*	*Kurtosis*	*Max*	*K-S*	*p*
Mother's education level	4.12	0.81	3	-0.22	-1.45	5	.25	.00
Father's education level	3.95	0.78	3	0.08	-1.37	5	.21	.00
Financial situation	1.94	0.82	1	0.11	-1.51	3	.24	.00
Parental perceptions of the child's academic potential	3.67	0.97	2	-0.29	-0.87	5	.24	.00
General Knowledge	10.28	2.92	6	0.05	-1.30	15	.13	.00
Visual Memory	10.32	2.79	6	0.09	-1.10	15	.10	.01
Block Assembly	11.15	3.39	6	-0.11	-1.34	16	.13	.00
Coding	10.98	3.45	5	-0.16	-1.45	16	.12	.00
Spatial orientation	1.49	0.50	1	0.06	-2.02	2	.34	.00
Temporal orientation	1.53	0.50	1	-0.13	-2.01	2	.36	.00
Word analysis skills	1.50	0.50	1	-0.02	-2.02	2	.34	.00
Word synthesis skills	1.47	0.50	1	0.13	-2.01	2	.36	.00
4th grade GPA	4.29	0.58	3	-0.52	-0.46	5	.12	.00
7th grade GPA	3.92	0.79	2	-0.60	-0.66	5	.12	.00

Table 1 indicates that parents reported limited financial resources and moderate education levels, with mothers being slightly more educated. The parents generally held positive perceptions of their child's academic

potential. Children exhibited high and variable scores on *General Knowledge*, *Visual Memory*, *Block Assembly*, and *Coding*. *Spatial* and *Temporal Orientation*, *Word Analysis*, and *Word Synthesis* showed minimal variation, suggesting ceiling or binary effects. Academic performance was strong in 4th grade but declined slightly by 7th grade, with increased variability, potentially reflecting heightened academic demands or shifts in student engagement. Regarding the distributions of the study variables, the values of skewness and kurtosis indicated systematic deviations from normality. Specifically, the consistently negative kurtosis values pointed to flatter (platykurtic) distributions, while the presence of mild skewness suggested asymmetry. Moreover, the results of the One-Sample Kolmogorov–Smirnov Test (K–S) confirmed that the distributions of all variables significantly deviated from normality ($p \leq .01$). Therefore, the assumption of normality was violated, suggesting that caution is warranted in further statistical analysis.

4th grade GPA prediction

For the modeling phase, two *Python* packages were used: *NumPy* (Van der Walt et al., 2011) and S*cikit-learn* (Pedregosa et al., 2011), while *Matplotlib* (Hunter, 2007) was used for data visualization. The process began with encoding categorical features into dummy/indicator variables. Next, all predictors were standardized, and the dataset was split into training (80%) and testing (20%) subsets, following standard ML validation procedures. Each ML model was then run individually, with results presented in Table 2 and Table 3, as well as in Figure 1.

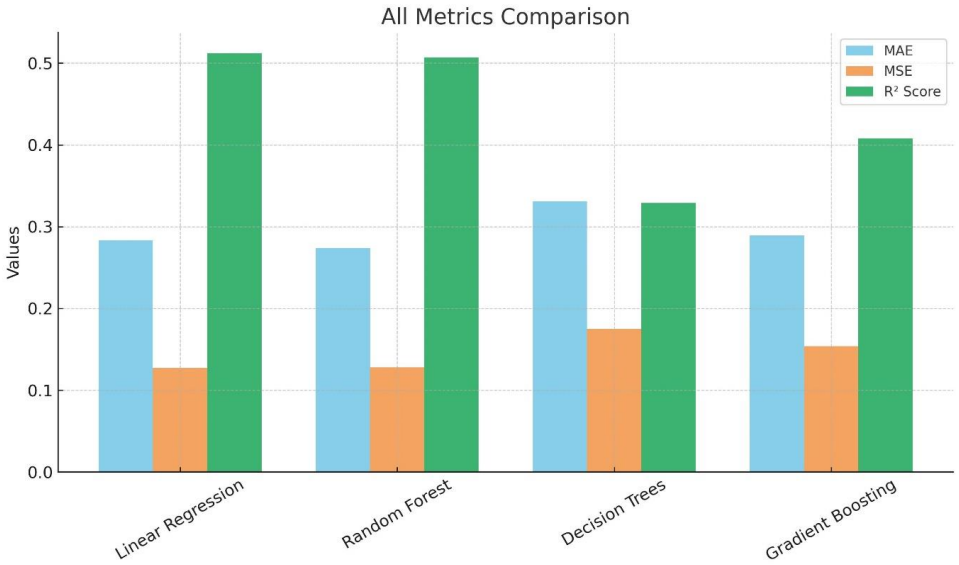
Table 2

The Results of All ML Models Used for 4th Grade GPA Prediction

Model	*MAE*	*MSE*	*R^2 Score*
Linear Regression	.28	.13	.51
Decision Trees	.33	.17	.33
Random Forest	.27	.13	.51
Gradient Boosting	.29	.15	.41

Figure 1

Performance Comparison of All ML Models Used for 4th grade GPA Prediction



The results in Table 2 and Figure 1 indicate that all models had limited explanatory power. The RF model and the linear regression model demonstrated the highest explained variance, accounting for approximately 51% of the variance in the dependent variable (4th grade GPA). Those two models outperformed the other two (i.e., GB and DT). Additionally, the mean absolute error (MAE) was lowest in the RF model, while the mean squared error (MSE) was lowest in linear regression, suggesting that larger errors were more heavily penalized in the latter, indicating some variance in prediction errors between the two models. Similar trends were observed in the other two models (i.e., DT and GB), where lower R^2 values corresponded with higher MAE and MSE. The contribution of each predictor across all four models is presented in Table 3.

Table 3

Partial Contribution of Each Predictor in All ML Models for 4th Grade GPA Prediction

	Importance Score			
Variables	Linear Regression	DT	RF	GB
Coding	.98	.29	.30	.30
Block Assembly	.69	.20	.16	.21
Visual Memory	.80	.17	.19	.20
General Knowledge	.67	.22	.18	.19
Parental perception of child's academic potential	.21	.04	.08	.06
Father's education level	.08	.03	.02	.01
Word synthesis skills	.16	.00	.01	.01
Mother's education level	.04	.01	.02	.01
Financial situation	.02	.00	.02	.01
Spatial orientation	.07	.00	.01	.01
Temporal orientation	.00	.01	.01	.00
Word analysis skills	.04	.00	.01	.00
Gender	.06	.00	.01	.00

Across all models (Table 3), *Coding* consistently emerged as the most important predictor of academic performance, highlighting its strong and stable predictive power. Other high-importance variables included *Visual Memory*, *Block Assembly,* and *General Knowledge*, all of which show substantial contributions across both linear and ensemble models, indicating the central role of cognitive abilities in predicting academic outcomes. It is important to note that linear regression shows higher partial contributions because it attributes importance based solely on direct linear effects without capturing complex interactions or nonlinearities that other ML models distribute across multiple variables (Molnar, 2020). On the other hand, the least important predictors across all models included *Temporal Orientation*, *Word Analysis Skills*, *Gender,* and *Financial Situation*, all of which showed minimal or no importance in 4th grade predictions. This suggests that demographic and socioeconomic variables contributed with little predictive value compared to direct cognitive skill measures. Notably,

while *Parental Perceptions of Child's Academic Potential* showed moderate importance in linear regression, it was far less influential in tree-based models, indicating that subjective assessments were less robust predictors than objective cognitive measures in more complex models.

7th Grade GPA Prediction

The same *Python* packages used for the previous analysis were employed for the modeling section related to 7th grade GPA.

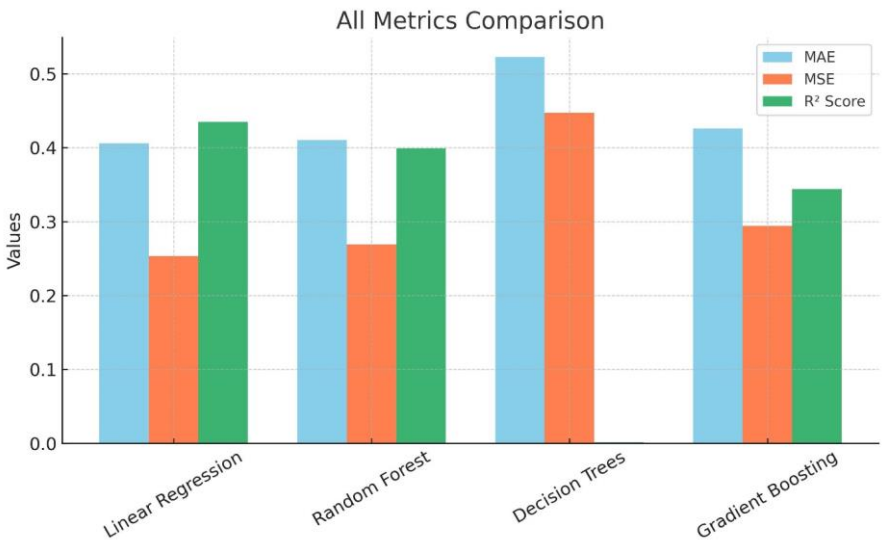
Table 4

The Results of All ML Models Used for 7th Grade GPA Prediction

Model	*MAE*	*MSE*	*R^2 Score*
Linear Regression	.40	.25	.44
Decision Trees	.52	.45	.01
Random Forest	.40	.27	.40
Gradient Boosting	.43	.29	.34

Figure 2

Performance Comparison of All ML Models Used for 7th Grade GPA Prediction



The results presented in Table 4 and Figure 2 suggest that all ML models again had limited explanatory power (R^2 varied from .01 to .44). Again, the linear regression model explained the highest portion of the variance, followed by the RF model. The GB model performed similarly, while DT was the weakest model. A very low R^2 in a decision tree model may indicate that the model is too simple (e.g., too shallow tree) or that the data are non-linear for that structure. Furthermore, the MAE and MSE of linear regression model and RF model indicated that larger errors were penalized more. The GB model had similar MAE and MSE scores, but an identical pattern – lower MAE and MSE were followed by higher R^2. The results of the impact of each feature in all models are listed in Table 5.

Table 5

Partial Contribution of Each Predictor in All ML Models for 7th Grade GPA Prediction

	Importance Score			
Variables	Linear Regression	DT	RF	GB
Coding	.99	.26	.27	.29
General Knowledge	.77	.24	.19	.22
Block Assembly	.70	.22	.16	.19
Visual Memory	.77	.17	.17	.16
Parental perceptions of child's academic potential	.33	.03	.10	.10
Financial situation	.02	.02	.02	.01
Father's education level	.12	.00	.02	.01
Mother's education level	.02	.02	.02	.01
Word Synthesis	.15	.01	.01	.01
Spatial orientation	.01	.00	.00	.00
Temporal orientation	.03	.00	.01	.00
Gender	.05	.00	.00	.00
Word analysis skills	.07	.00	.00	.00

The results presented in Table 5 suggest that *Coding* stood out as the most influential predictor across all models, indicating a consistently strong role in predicting academic outcomes. Other highly influential predictors included *General Knowledge*, *Visual Memory,* and *Block Assembly*, reinforcing the dominance of cognitive abilities as key predictors regardless of the model used. On the other hand, the least important predictors across all models included *Gender*, *Spatial Orientation*, *Word Analysis Skills,* and *Temporal Orientation*, all of which showed negligible or no contribution. Similarly, demographic variables such as *Father's Education Level*, *Mother's Education Level,* and *Financial Situation* had minimal predictive value. Interestingly, *Parental Perception of Child's Academic Potential* retained moderate importance in linear regression, but lost influence in all other models, suggesting subjective evaluations contribute less to performance prediction when more complex, non-linear relationships are modeled. As was the case in the prediction of 4th grade GPA, linear regression again showed higher partial contributions for several predictors, as it assigns importance based solely on direct linear relationships, without accounting for complex interactions or nonlinear effects that are more accurately captured and distributed across variables in machine learning models (Molnar, 2020).

Discussion

The comparative analysis revealed differences in predictive performance among the tested algorithms. In 4th grade, linear regression and RF achieved the same R^2, although RF yielded a lower MSE. In 7th grade, linear regression slightly outperformed all models across all evaluation metrics, indicating that, despite its simplicity, it effectively captures relevant linear patterns. Nonetheless, this does not diminish the value of RF, particularly in situations where the assumptions of linear models may be violated. Linear regression assumes linearity, constant variance, and normally distributed residuals (Kutner et al., 2005), which often do not hold in real-world educational data - an issue also reflected in our findings, where skewness, kurtosis, and the Kolmogorov–Smirnov test indicated deviations from normality. Its higher accuracy may reflect data-specific factors, such as the train-test split or overfitting to linear trends. In contrast, RF, a nonparametric ensemble method, builds multiple decorrelated trees via bootstrap

aggregation and random feature selection (Breiman, 2001), enabling them to capture nonlinearities and interactions that linear models miss. Although they may have slightly higher variance in low-noise or small-sample settings, they reduce bias when data involve multicollinearity, threshold effects, or non-additive influences (Hastie et al., 2009). They're also more robust to outliers and offer internal out-of-bag error estimates, improving reliability. Given these strengths, RF offers a more robust, theoretically sound framework. Even if they do not always yield the lowest prediction error, their flexibility and robustness make them a valuable tool for educational prediction tasks involving nonlinear patterns and complex interactions.

4th Grade GPA prediction

Within all models related to the 4th grade GPA prediction, the *Coding* subtest had the strongest predictive value, underscoring the importance of processing speed and attention in academic performance (Fry & Hale, 2000). These results align with previous research, highlighting processing speed as a crucial factor in learning, particularly in symbol decoding and problem-solving tasks (Demetriou et al., 2014). *Visual Memory* was another significant predictor, reinforcing the role of working memory in academic achievement, which aligns with previous research suggesting that visuospatial working memory is critical for success in math and science (Alloway & Alloway, 2010; Bull et al., 2008). Additionally, *General Knowledge* was a strong predictor, supporting theories of crystallized intelligence that emphasize accumulated knowledge and experience as key factors in academic success (Cattell, 1987; Neisser et al., 1996). The predictive significance of *Block Assembly* highlights the role of spatial reasoning, a cognitive skill linked to problem-solving, in academic success (Wai et al., 2009; Verdine et al., 2014).

Spatial Orientation and *Temporal Orientation* had minimal or no impact on GPA. While relevant for daily functioning, these skills appear less crucial for structured academic tasks relying on working memory and reasoning (Diamond, 2013). Gender and parents' education level also had negligible influence, suggesting that cognitive and environmental factors outweigh biological sex differences in academic performance and offer limited predictive utility for GPA at this developmental stage (Halpern et al., 2007; Hyde, 2014). Similarly, *Word Analysis and Synthesis Skills* had limited

predictive values, likely because literacy skills are well-established by later elementary grades (Torgesen, 2002).

7th Grade GPA prediction

Results concerning the 7th grade GPA differed from those related to the 4th grade. While *Coding* remained the strongest predictor, its relative influence declined, and overall model R^2 scores were lower across all models. *General Knowledge*, *Block Assembly*, and *Visual Memory* retained some predictive power but were no longer dominant, which suggests that the explanatory power of early cognitive variables diminishes over time. This may be tentatively interpreted in light of Vygotsky's (1978) socio-cultural theory, which emphasizes the growing role of external factors such as instruction, environment, and motivation. Socioeconomic and demographic variables, such as *Mother's* and *Father's Education Level, Financial Situation,* and *Gender*, remained weak predictors across all models. The low importance of *Mother's Education Level* challenges prior findings that parental education strongly affects academic achievement (Davis-Kean, 2005), possibly indicating that school-based factors in this sample mitigate socioeconomic disadvantages.

Implications, limitations and future directions

The findings of this study have important implications for educational policy and intervention strategies. Given that cognitive readiness assessments were found to be strong predictors of GPA, early screening and targeted support programs should be implemented to help students with lower readiness levels. Schools could benefit from incorporating ML models into early warning systems (EWS) to identify at-risk students and provide timely interventions, such as personalized tutoring, cognitive skill development programs, and socio-emotional support (Bowers & Zhou, 2019; Jayaprakash et al., 2014). Furthermore, while RF did not outperform linear regression in this instance, its flexibility, robustness, and interpretability make it well-suited for complex educational data. It is especially valuable for identifying nuanced predictor interactions and offering actionable insights beyond what linear coefficients can provide.

This study has some limitations. While it included many predictors, factors like student motivation, peer influence, and teacher quality were not measured. Future research should address these gaps. Additionally, Serbia's centralized education system, with standardized curricula and GPA-based evaluations, may not be directly comparable to more flexible systems. Thus, findings may not fully apply to countries with different educational policies and socio-cultural influences. Cross-cultural studies could clarify whether key predictors of academic success are universal or system-dependent.

Nevertheless, this study underscores the potential of ML models, particularly RF, in predicting academic performance in primary school GPA. By identifying key predictors of GPA, this research contributes to the growing field of educational data mining and highlights the practical applications of advanced machine learning models in educational settings. The findings suggest that integrating various predictive models into school systems could facilitate early intervention strategies, ultimately improving personal learning, student outcomes, and informing data-driven policy decisions. Future research should build upon these results by incorporating additional predictors, expanding to diverse educational contexts, and exploring advanced ML techniques to further refine academic forecasting models.

Conflict of interest

We have no conflicts of interest to disclose.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

Alloway, T. P., & Alloway, R. G. (2010). Investigating the predictive roles of working memory and IQ in academic attainment. *Journal of Experimental Child Psychology*, *106*(1), 20–29. https://doi.org/10.1016/j.jecp.2009.11.003

Baker, R. S. J. d., & Inventado, P. S. (2014). Educational data mining and learning analytics. In J. A. Larusson & B. White (Eds.), *Learning analytics: From research to practice* (pp. 61–75). Springer. https://doi.org/10.1007/978-1-4614-3305-7_4

Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist, 57*(2), 111–127. https://doi.org/10.1037/0003-066X.57.2.111

Biro, M., Novović, Z. i Tovilović, S. (2006). Kognitivno funkcionisanje edukativno zapuštene dece predškolskog uzrasta [Cognitive functioning of educationally deprived pre-school children]. *Psihologija, 39*(2), 183–206. https://doiserbia.nb.rs/Article.aspx?id=0048-57050602183B

Bowers, A. J., & Zhou, X. (2019). Receiver Operating Characteristic (ROC) Area under the curve (AUC): A diagnostic measure for evaluating the accuracy of predictors of education outcomes. *Journal of Education for Students Placed at Risk (JESPAR)*, *24*(1), 20–46. https://doi.org/10.1080/10824669.2018.1523734

Breiman, L. (2001). Random forests. *Machine Learning, 45*(1), 5–32. https://doi.org/10.1023/A:1010933404324

Breiman, L., Friedman, J. H., Olshen, R. A., & Stone, C. J. (1984). *Classification and regression rrees*. Routledge. https://doi.org/10.1201/9781315139470

Bucci Liddy, C. M., Brumariu, L. E., Diaconu-Gherasim, L. R., & Hunter, D. M. (2021). Maternal parenting and teaching strategies: relations with children's academic competence. *Educational Studies*, 1–16. https://doi.org/10.1080/03055698.2021.1940870

Bull, R., Espy, K. A., & Wiebe, S. A. (2008). Short-term memory, working memory, and executive functioning in preschoolers: Longitudinal predictors of mathematical achievement at age 7 years. *Developmental Neuropsychology, 33*(3), 205–228. https://doi.org/10.1080/87565640801982312

Burke, M. A., & Sass, T. R. (2013). Classroom peer effects and student achievement. *Journal of Labor Economics*, *31*(1), 51–82. https://doi.org/10.1086/666653

Cattell, R. B. (1987). *Intelligence. Its structure, growth, and action.* North-Holland.

Chen, X., & Ding, W. (2023). Early prediction of students' academic performance using machine learning techniques. *Journal of Educational Computing Research, 61*(2), 371–392. https://doi.org/10.1177/07356331221075930

Davis-Kean, P. E. (2005). The influence of parent education and family income on child achievement: The indirect role of parental expectations and the home environment. *Journal of Family Psychology, 19*(2), 294–304. https://doi.org/10.1037/0893-3200.19.2.294

Demetriou, A., Spanoudis, G., Shayer, M., van der Ven, S., Brydges, C. R., Kroesbergen, E., Podjarny, G., & Swanson, H. L. (2014). Relations between speed, working memory, and intelligence from preschool to adulthood: Structural equation modeling of 14 studies. *Intelligence*, *46*, 107–121. https://doi.org/10.1016/j.intell.2014.05.013

Diamond, A. (2013). Executive functions. *Annual Review of Psychology, 64*(1), 135–168. https://doi.org/10.1146/annurev-psych-113011-143750

D'Mello, S. K., & Graesser, A. C. (2012). AutoTutor and affective AutoTutor: Learning by talking with cognitively and emotionally intelligent computers that talk back. *ACM Transactions on Interactive Intelligent Systems, 2*(4), Article 23. https://doi.org/10.1145/2395123.2395128

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Pagani, L. S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., & Japel, C. (2006). School readiness and later achievement. *Developmental Psychology, 43*(6), 1428–1446. https://doi.org/10.1037/0012-1649.43.6.14284o

Eccles, J. S., & Roeser, R. W. (2011). Schools as developmental contexts during adolescence. *Journal of Research on Adolescence*, *21*(1), 225–241. https://doi.org/10.1111/j.1532-7795.2010.00725.x

Entwisle, Doris R., Alexander, Karl L., & Olson, L. (2005). First grade and educational attainment by Age 22: A New Story. *American Journal of Sociology, 110*(5), 1458–1502. https://doi.org/10.1086/428444

Fan, X., & Chen, M. (2001). Parental involvement and students' academic achievement: A meta-analysis. *Educational Psychology Review*, *13*(1), 1–22. https://doi.org/10.1023/a:1009048817385

Fernández-Delgado, M., Cernadas, E., Barro, S., & Amorim, D. (2014). Do we need hundreds of classifiers to solve real world classification problems? *Journal of Machine Learning Research, 15*(1), 3133–3181. https://doi.org/10.5555/2627435.2697065

Friedman, J. H. (2001). Greedy function approximation: A gradient boosting machine. *The Annals of Statistics, 29*(5), 1189–1232. https://doi.org/10.1214/aos/1013203451

Fry, A. F., & Hale, S. (2000). Relationships among processing speed, working memory, and fluid intelligence in children. *Biological Psychology*, *54*(1-3), 1–34. https://doi.org/10.1016/s0301-0511(00)00051-x

Gerasimović, M. (2012). *Prilog razvoju metodologija predviđanja i odlučivanja primenom veštačkih neuronskih mreža* [Contribution to development of

methodology for prediction and decision-making by applying artificial neural networks]. Doctoral dissertation, University of Belgrade, Faculty of Mechanical Engineering.

Halpern, D. F., Benbow, C. P., Geary, D. C., Gur, R. C., Hyde, J. S., & Gernsbacher, M. A. (2007). The science of sex differences in science and mathematics. *Psychological Science in the Public Interest*, *8*(1), 1–51. https://doi.org/10.1111/j.1529-1006.2007.00032.x

Hastie, T., Tibshirani, R., & Friedman, J. (2009). *The elements of statistical learning: Data mining, inference, and prediction* (2nd ed.). Springer. https://doi.org/10.1007/978-0-387-84858-7

Hunter, J. D. (2007). Matplotlib: A 2D graphics environment. *Computing in Science & Engineering, 9*(3), 90–95. https://doi.org/10.1109/MCSE.2007.55

Hyde, J. S. (2014). Gender similarities and differences. *Annual Review of Psychology*, *65*(1), 373–398. https://doi.org/10.1146/annurev-psych-010213-115057

Imose, R., & Barber, L. K. (2015). Using undergraduate grade point average as a selection tool: A synthesis of the literature. *The Psychologist-Manager Journal, 18*(1), 1–11. https://doi.org/10.1037/mgr0000025

Ivić, I. D., Milinković, M., Rosandić, R. i Smiljanić-Čolanović, V. (1976). *Priručnik za NBS [Manual for NBS]*. Zavod za udžbenike i nastavna sredstva.

Ivić, I., Milinković, M., Pešikan, A. i Bukvić, A. (1995). *Test za ispitivanje prvaka (TIP-1) – Priručnik [Test for Assessing First-Graders (TIP-1) – Manual]*. Društvo Psihologa Srbije.

Jayaprakash, S. M., Moody, E. W., Lauría, E. J. M., Regan, J. R., & Baron, J. D. (2014). Early alert of academically at-risk students: An open source analytics initiative. *Journal of Learning Analytics*, *1*(1), 6–47. https://doi.org/10.18608/jla.2014.11.3

Jeynes, W. H. (2007). The relationship between parental involvement and urban secondary school student academic achievement. *Urban Education*, *42*(1), 82–110. https://doi.org/10.1177/0042085906293818

Jovanović, V., Tovilović, S., Novović, Z., & Biro, M. (2010). Prediction of school achievement and conative functioning among roma and non-roma children. *Primenjena Psihologija*, *3*(3), 239–254. https://doi.org/10.19090/pp.2010.3.239-254

Kutner, M. H., Nachtsheim, C. J., Neter, J., & Li, W. (2005). *Applied linear statistical models*. McGraw-hill.

Lareau, A. (2018). *Unequal childhoods: Class, race, and family life*. In D. B. Grusky & J. Hill (Eds.), *Inequality in the 21st century* (pp. 444–451). Routledge. https://doi.org/10.1525/9780520949904

Lawson, H., Lira, A., Lee, A., Lee, M., Linnenbrink-Garcia, L., Walton, S. P., & Briedis, D. (2020). Predicting engineering student success: An examination of college entrance exams, high school GPA, perceived competence, engineering achievement, and persistence. *2020 ASEE Virtual Annual Conference Content Access Proceedings*. https://doi.org/10.18260/1-2--35072

Li, J., Xue, E., & You, H. (2024). Parental educational expectations and academic achievement of left-behind children in china: The mediating role of parental involvement. *Behavioral Sciences*, *14*(5), 371–371. https://doi.org/10.3390/bs14050371

Lipton, Z. C. (2016). The mythos of model interpretability. *Proceedings of the 2016 ICML Workshop on Human Interpretability in Machine Learning (WHI 2016)*, 96–100. https://arxiv.org/abs/1606.03490

McClelland, M. M., Tominey, S. L., Schmitt, S. A., & Duncan, R. (2017). SEL interventions in early childhood. *The Future of Children*, *27*(1), 33–47. https://doi.org/10.1353/foc.2017.0002

McKinney, W. (2010). Data structures for statistical computing in Python. In: S. Van der Walt & J. Millman (Eds.). *Proceedings of the 9th Python in Science Conference* (pp. 51–56). https://doi.org/10.25080/Majora-92bf1922-00a

Molnar, C. (2020). *Interpretable machine learning*. Mucbook Clubhouse.

Mullis, I. V. S., Martin, M. O., Foy, P., & Arora, A. (2012). *TIMSS 2011 international results in mathematics*. TIMSS & PIRLS International Study Center, Boston College. https://timss.bc.edu/timss2011/international-results-mathematics.html

Naite, I. (2021). Impact of parental involvement on children's academic performance at crescent international school, Bangkok, Thailand. *IOP Conference Series: Earth and Environmental Science*, *690*(1), 012064. https://doi.org/10.1088/1755-1315/690/1/012064

Neisser, U., Boodoo, G., Bouchard, T. J., Jr., Boykin, A. W., Brody, N., Ceci, S. J., Halpern, D. F., Loehlin, J. C., Perloff, R., Sternberg, R. J., & Urbina, S. (1996). Intelligence: Knowns and unknowns. *American Psychologist, 51*(2), 77–101. https://doi.org/10.1037/0003-066X.51.2.77

Novović, Z., Biro, M., Baucal, A., i Tovilović, S. (2007). *Test zrelosti za školu [School Maturity Test]*. Društvo Psihologa Srbije.

Ojajuni, O., Ayeni, F., Akodu, O., Ekanoye, F., Adewole, S., Ayo, T., Misra, S., & Mbarika, V. (2021). Predicting student academic performance using machine learning. *Computational Science and Its Applications – ICCSA 2021*, 481–491. https://doi.org/10.1007/978-3-030-87013-3_36

Pedregosa, F., Varoquaux, G., Gramfort, A., Michel, V., Thirion, B., Grisel, O., Blondel, M., Prettenhofer, P., Weiss, R., Dubourg, V., Vanderplas, J., Passos, A., Cournapeau, D., Brucher, M., Perrot, M., & Duchesnay, É. (2011). Scikit-learn: Machine learning in Python. *Journal of Machine Learning Research, 12*, 2825–2830. http://www.jmlr.org/papers/volume12/pedregosa11a/pedregosa11a.pdf

Rajendran, S., Chamundeswari, S., & Sinha, A. A. (2022). Predicting the academic performance of middle- and high-school students using machine learning algorithms. *Social Sciences & Humanities Open*, *6*(1), 100357. https://doi.org/10.1016/j.ssaho.2022.100357

Reardon, S. F. (2018). The widening academic achievement gap between the rich and the poor. *Inequality in the 21st Century*, 177–189. https://doi.org/10.4324/9780429499821-33

Sirin, S. R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of Educational Research*, *75*(3), 417–453. https://doi.org/10.3102/00346543075003417

Smith, J., & Lee, A. (2022). Advancing predictive modeling in education: From linear regression to ensemble methods. *Journal of Educational Data Science, 10*(3), 123–145. https://doi.org/10.1234/jeds.2022.10307

Soltanlou, M., Artemenko, C., Dresler, T., Fallgatter, A. J., Ehlis, A.-C., & Nuerk, H.-C. (2019). Math anxiety in combination with low visuospatial memory impairs math learning in children. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.00089

Stanković, N. Lj. (2021*). Faktori učenja i predviđanje uspešnosti u programiranju primenom veštačkih neuronskih mreža* [Factors of learning and predicting success in programming using artificial neural networks]. Doctoral dissertation, University of Kragujevac, Faculty of Techincal Sciences.

Stock, P., Desoete, A., & Roeyers, H. (2009). Predicting arithmetic abilities. *Journal of Psychoeducational Assessment*, *27*(3), 237–251. https://doi.org/10.1177/0734282908330587

Tamayo Martinez, N., Xerxa, Y., Law, J., Serdarevic, F., Jansen, P. W., & Tiemeier, H. (2022). Double advantage of parental education for child educational achievement: the role of parenting and child intelligence. *European Journal*

of Public Health, *32*(5), 690–695. https://doi.org/10.1093/eurpub/ckac044

Torgesen, J. K. (2002). The prevention of reading difficulties. *Journal of School Psychology*, *40*(1), 7–26. https://doi.org/10.1016/s0022-4405(01)00092-9

Tyler, J. H., & Lofstrom, M. (2009). Finishing high school: Alternative pathways and dropout recovery. *The Future of Children*, *19*(1), 77–103. https://www.jstor.org/stable/27795036

Van der Walt, S., Colbert, S. C., & Varoquaux, G. (2011). The NumPy array: A structure for efficient numerical computation. *Computing in Science & Engineering, 13*(2), 22–30. https://doi.org/10.1109/MCSE.2011.37

Van Rossum, G., & Drake, F. L. (2009). *Python 3.* Python Software Foundation. https://www.python.org/

Vapnik, V. N. (1995). *The nature of statistical learning theory*. Springer. https://doi.org/10.1007/978-1-4757-2440-0

Verdine, B. N., Irwin, C. M., Golinkoff, R. M., & Hirsh-Pasek, K. (2014). Contributions of executive function and spatial skills to preschool mathematics achievement. *Journal of Experimental Child Psychology*, *126*, 37–51. https://doi.org/10.1016/j.jecp.2014.02.012

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (Vol. 86). Harvard University Press.

Wai, J., Lubinski, D., & Benbow, C. P. (2009). Spatial ability for STEM domains: Aligning over 50 years of cumulative psychological knowledge solidifies its importance. *Journal of Educational Psychology, 101*(4), 817–835. https://doi.org/10.1037/a0016127

Zhang, P., Wu, H.-N., Chen, R.-P., Dai, T., Meng, F.-Y., & Wang, H.-B. (2020). A critical evaluation of machine learning and deep learning in shield-ground interaction prediction. *Tunnelling and Underground Space Technology*, *106*, 103593. https://doi.org/10.1016/j.tust.2020.103593

Primenjena psihologija
Vol. 19, No. 1, pp. 29–56, 2026

Research Article

Adding Mindfulness to CBT in Group Counseling: A Randomized Pilot Study on Self-Efficacy, Cognitive Flexibility, and Self-Compassion

Begüm Toprak[1], Derya Alkan[1], Gülfem Çakır Çelebi[1], and Evrim Çetinkaya Yıldız[1]✉

[1]*Akdeniz University, Faculty of Education, Department of Guidance and Counselling, Antalya, Türkiye*

ABSTRACT

This study examined the impact of an eight-session group counseling program that combined cognitive behavioral therapy (CBT) with mindfulness meditation on three key aspects: self-efficacy, cognitive flexibility, and self-compassion. The study group consisted of 17 university students from several faculties at a public university in Southern Anatolia, Türkiye. The data were gathered using the Cognitive Flexibility Inventory, the Self-Compassion Scale, and the Self-Efficacy Scale. The experimental group engaged in an 8-week program that combined CBT and mindfulness-based group counseling, whereas the control group received no intervention. The results of this study indicated that, in the experimental group, participants' self-efficacy, cognitive flexibility, and self-compassion post-test scores were significantly higher than pre-test scores. The results also suggest that although no significant differences were obtained in self-efficacy post-test scores between the experimental and control groups, participants who received the intervention demonstrated higher post-test scores in cognitive flexibility and self-compassion than those in the control group.

Keywords: group counseling, mindfulness integrated CBT, self-efficacy, self-compassion, cognitive flexibility

UDK: 615.851
DOI: 10.19090/pp.v19i1.2615
Received: 24.02.2025.
Revised: 02.09.2025.
Accepted: 16.09.2025.

✉ Corresponding author's email: evrimcy@akdeniz.edu.tr

Introduction

College life can be characterized as a period of significant changes, during which the importance of adaptation skills increases even further with new developments such as hybrid teaching (Gelles et al., 2020; Lee & Lee, 2022). In this transitional period, called emerging adulthood, the individual has reached the end of adolescence but has not yet fully assumed the role of an adult (Arnett, 2015). During these years, individuals try to gain independence in various fields while trying to separate themselves from their families. College students undergo numerous transformations as they come to understand themselves. Key developmental tasks during this time include identifying and preparing for adult responsibilities, achieving independence, pursuing a career, realizing personal potential, and adapting socially (Aktaş, 1997). Locke et al. (2016) stated that the main problems encountered during college life are depression, anxiety, stress, family relationships, relationship problems, mourning, academic performance, interpersonal skills, unstable emotional state, and adaptation to a new environment. Pedrelli et al. (2015) reported that anxiety disorders, depression, suicide, eating disorders, and substance abuse are common mental health problems among university students. According to Coşkun (2018), while the primary motivations for university students to visit counseling centers are related to professional and educational concerns, a significant number of students also seek assistance for issues involving interpersonal relationships, such as enhancing assertiveness, forming friendships, and resolving conflicts.

One of the concepts considered critical during university years is cognitive flexibility, which helps students cope with issues that negatively impact their quality of life and adjustment (Parvizi & Özabacı, 2022). Cognitive flexibility refers to the ability to reorganize one’s cognitive processes in order to respond effectively to unexpected events or changing environmental conditions (Cañas et al., 2006). According to the cognitive approach, a person's problems in a situation stem from the inflexibility of the cognitions they develop in response to the event (Cañas et al., 2003). A person with strong cognitive flexibility sees multiple options in a situation and has the self-efficacy to adapt to it (Martin & Rubin, 1995). Dennis and Vonder Wal (2010) proposed that people with strong cognitive flexibility comprehend challenging situations as manageable, recognize various interpretations and

alternatives in these circumstances, and can generate multiple solutions to such difficulties.

As one's cognitive flexibility improves, there is a corresponding increase in self-compassion (Martin et al., 2011) and self-efficacy (Heydari et al., 2022). Self-compassion is defined as an understanding, compassionate, and sensitive approach to oneself in which the person recognizes and accepts the painful emotions instead of avoiding them (Neff, 2003). In other words, self-compassion involves the acceptance, kindness, and compassion we show to ourselves when faced with painful experiences. Instead of avoiding pain, people with high self-compassion accept that pain is universal and that every person can make mistakes. In essence, those with high levels of compassion exhibit empathy not only towards themselves but also towards people around them, reflecting their awareness of common humanity (Germer, 2009).

Self-efficacy, another related concept, also helps college students adapt to academic challenges and new learning environments. Bandura (1977) introduced the concept of self-efficacy, which is rooted in the principle of reciprocal determinism in social-cognitive theory. Self-efficacy, as a concept, refers to an individual's self-assessment of their ability to navigate diverse challenges (Bandura, 1982). This pertains to one's judgment of their capabilities to effectively handle the particular circumstances they encounter. Self-efficacy is related to both external (reward-punishment) and internal (belief-thought-expectation) factors. These factors shape behavior; therefore, self-efficacy plays a crucial role in achieving success (Bandura, 2000). Research has demonstrated a positive relationship between mindfulness and self-efficacy (Jin et al., 2020; Latorre et al., 2023). According to findings by Sharma and Kumra (2022), self-efficacy plays an intermediary role in the connection between mindfulness and several psychological conditions, such as stress, depression, and anxiety. Furthermore, correlational and meta-analytic studies (Iskender, 2009; Liao et al., 2021; Souza & Hutz, 2016) have revealed a positive association between self-compassion and self-efficacy. Findings from correlational research indicate that practicing self-compassion techniques may lead to improvements in both self-efficacy (Moeini et al., 2019) and cognitive flexibility (Sadeghi et al., 2018).

Group counseling for college students

Many universities have counseling centers, where college students can request individual, group, and career counseling or guidance related to various concerns. Group counseling can help individuals get feedback from others, try new skills, and understand that they are not alone in their struggles (Corey et al., 2013). Previous studies examining group interventions for college students have found CBT-based interventions (Alavi et al., 2021; Özer & Yalçın, 2020; Yıldız & Aslan, 2017) and group interventions based on mindfulness (Li et al., 2023; Parcover et al., 2018) to be effective in reducing psychological distress and improving psychological well-being.

CBT enables individuals to question dysfunctional assumptions and beliefs, and to investigate these beliefs from different angles by developing cognitive flexibility (Mitchell et al., 2013). As noted earlier, cognitive flexibility refers to an individual's capacity to identify alternative courses of action in challenging situations and to adaptively reassess these options by modifying their cognitive appraisals. Mindfulness, on the other hand, is a tool for enhancing psychological flexibility and is an integral part of the various therapeutic modalities within the third wave of CBT (Baer, 2003). Unlike cognitive flexibility, psychological flexibility involves one’s capacity to remain in the present moment, accept troubling thoughts and emotions without attempting to change them, and act in accordance with one's values, rather than acting on difficult internal experiences (Aslan & Turk, 2022). According to Kabat-Zinn (2003), mindfulness is a form of conscious awareness that arises when individuals intentionally focus on the present moment and observe their experiences without judgment.

Studies consistently demonstrate the positive effects of mindfulness on psychological functioning. For example, Latorre et al. (2023) reported that mindfulness was directly associated with self-compassion and indirectly related to self-efficacy. Similarly, Tovilović et al. (2022) found that university students who completed a mindfulness-based self-help program showed greater psychological flexibility, reduced ruminative thinking, and improved attentional flexibility. Beyond these individual findings, research across different developmental stages indicates that both CBT-based group interventions and mindfulness-based practices contribute to improvements in key psychological variables. Specifically, these interventions have been

shown to enhance cognitive flexibility (Abedi et al., 2023; Bahrami et al., 2022), self-efficacy (Hyun et al., 2005), and self-compassion (Hamedani et al., 2023; Kurtoğlu & Başgül, 2023; Taylor et al., 2020). When focusing specifically on emerging adults, the findings remain consistent. Studies indicate that CBT-based group interventions increase university students' cognitive flexibility (Fazeli et al., 2015; Nazarzadeh et al., 2015) and self-efficacy (Zeidi et al., 2020), while mindfulness-based group interventions improve self-compassion and self-efficacy (Taylor et al., 2020).

Over the past few years, events such as the COVID-19 pandemic and the 2023 Türkiye-Syria earthquake have occasionally necessitated the delivery of higher education through distance or hybrid learning methods. The shift to distance education, along with restrictions on social life, significantly altered individuals' daily routines, learning experiences, and social interactions. During this period, college students faced various challenges, including academic difficulties, career concerns, financial concerns, restrictions on activities, and social isolation (Salimi et al., 2021; Son et al., 2020). A study by Von Keyserlingk et al. (2022) examined students' stress levels, self-efficacy, and self-regulation both prior to and after the COVID-19 pandemic. The findings revealed that while stress levels generally increased following the beginning of the pandemic, students who possessed high self-regulation and self-efficacy stated a smaller increase in stress compared to their peers. Investigations into students' transition back to classroom-based education in the aftermath of the COVID-19 pandemic have identified a widespread deterioration in their emotional well-being and overall quality of life compared to pre-pandemic levels. The findings suggest that student-focused strategies may support learners in regulating their mental states and enhancing overall well-being by strengthening factors such as self-efficacy, adaptive coping skills, and engagement in physical activity (Liverpool et al., 2023). Although several years have passed since the acute phase of the COVID-19 pandemic, evidence indicates that its educational and psychosocial consequences may persist, particularly during key developmental transitions. In this context, university students may still face adaptation challenges when navigating in-person academic and social environments. Accordingly, the present study focused on enhancing college students' cognitive flexibility, self-efficacy, and self-compassion, with the

aim of supporting their ongoing adjustment to social contexts and facilitating more effective management of developmental challenges.

Our study employed an experimental design with an intervention (experimental) group and a no-intervention control group. The experimental group participated in an eight-session group therapy program combining CBT and mindfulness meditation, whereas the control group received no intervention. The effects of the program were assessed in terms of changes in participants' cognitive flexibility, self-compassion, and self-efficacy. Our first hypothesis suggested that there would be a significant increase in the cognitive flexibility, self-compassion, and self-efficacy scores of students in the experimental group from pre-test to post-test. Our second hypothesis proposed that the post-test scores of cognitive flexibility, self-efficacy, and self-compassion for university students in the experimental group would be significantly higher than the post-test scores of the control group.

Method

This study employed an experimental methodology featuring a control group allocated through randomization, with evaluations conducted prior to and following the study. This study used a 2 × 2 split-plot factorial design, comparing pretest-post test results between the intervention and control groups.

Participants

The study group initially consisted of 18 participants, randomly assigned to either an experimental or control group (i.e., 9 participants per group). However, after the first session, one group member dropped out. Thus, the final sample comprised 17 undergraduate students, 8 (one male, seven females) of whom were allocated to the experimental group, and 9 (2 males, 7 females) allocated to the control group. Participants' age ranged from 18 to 21, with a mean age of 18.75 years (*SD* = 1.164). All participants were enrolled in different departments at a public university located in Türkiye. To be eligible for participation, individuals had to meet three criteria: they did not have a diagnosed psychiatric condition, they were not receiving any psychological treatment, they would not receive any psychological

treatment until the study was completed, and they would willingly agree to participate in the study (i.e., the participation was voluntary).

Instruments

The Cognitive Flexibility Inventory (CFI)

The CFI, initially established by Dennis and Vander Wal (2010), underwent cultural adaptation for use in Türkiye by Sapmaz and Doğan (2013). This assessment tool comprises 20 items, each evaluated on a seven-point Likert scale. The CFI is structured into two distinct subscales: control and alternatives. The control subscale consisted of 7 items (α = .84), the alternatives subscale consisted of 13 items (α = .90), and the Cronbach's alpha value for the overall cognitive flexibility value was .90.

The Self-Compassion Scale (SCS)

Neff (2003) developed the SCS, which was subsequently translated into Turkish by Akın et al. (2007). The instrument comprises 26 items which were evaluated on a five-point Likert scale and divided into six subscales: self-kindness (α = .77, *n* = 5), self-judgment (α = .72, *n* = 4), common humanity (α = .72, *n* = 4), isolation (α = .80, *n* = 4), mindfulness (α = .74, n = 4), and over-identification (α = .74, *n* = 5). The test-retest reliability coefficients were .69, .59, .66, .60, .69, and .56, in the same order.

The Self-Efficacy Scale (SES)

Sherer et al. (1982) initially developed the SES, which was later adapted for use in Turkish by Yıldırım and İlhan (2010). SES consisted of 17 items evaluated on a five-point Likert scale. The original scale demonstrated a Cronbach's alpha coefficient of .86. For the Turkish version, the internal consistency coefficient was calculated as .80, while the test-retest reliability coefficient was .69.

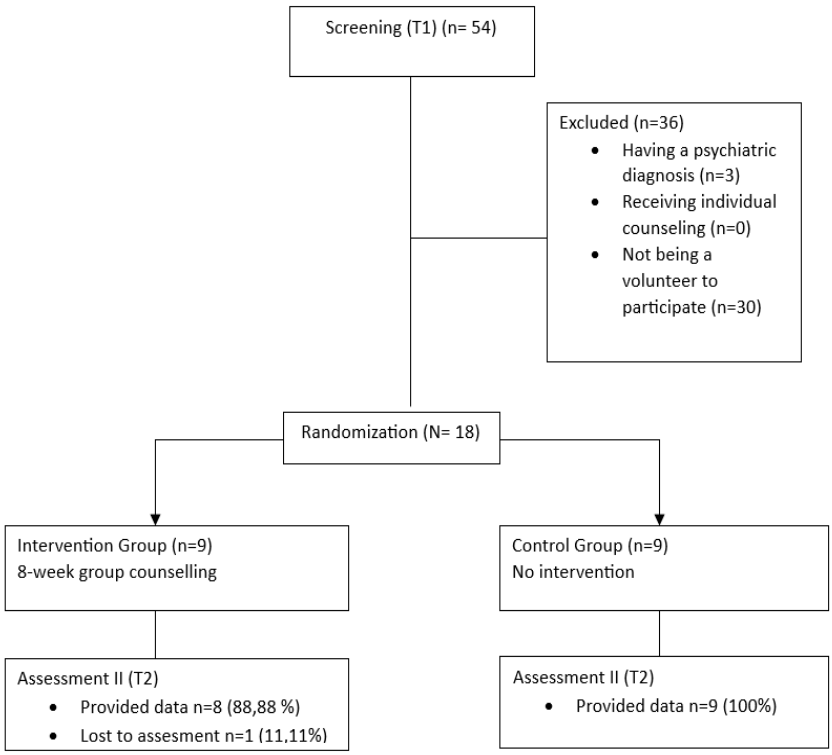
Procedure

Following approval from the university's ethics committee, the students were informed about the counseling group through various online channels. A group of 54 students filled out a personal information form that contained details relevant to the inclusion criteria. Following this, a short screening interview (~15 minutes), including questions about the group

counseling process, participation, and inclusion criteria, was held individually with each participant (n = 54) in person. After the initial screening interviews, the researchers selected students who met the inclusion criteria (n = 18) and randomly allocated them to groups. The experimental group was briefed by the research team on the content, duration, and meeting location of the counseling group. All participants provided signed informed consents. The authors confirm that this study was conducted in accordance with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. This study was approved by the Ethics Committee of Akdeniz University (21.11.2022/ No. 426, Antalya, Türkiye). The flow of the study is summarized in Figure 1.

Figure 1

Study Flow



Both members of the experimental and control groups completed the scales at the start (pre-test) and end (post-test) of the program. One participant in the experimental group withdrew after the initial session. The experimental group participated in an 8-week group counseling program that integrated CBT and mindfulness. The control group did not receive any intervention during or after the study.

Group counseling based on CBT combined with mindfulness meditation

The theoretical basis of the group counseling program was CBT and mindfulness. The program used CBT-based techniques, exercises, and mindfulness meditation practices. The activities and exercises were designed by researchers using various mindfulness sources (Alidina, 2020; Germer, 2009; Kabat-Zinn, 2012; Stahl & Goldstein, 2019; Williams & Penman, 2012), CBT (Beck, 2016; Cully & Teten, 2008; Türkçapar, 2018), and group counseling activities (e.g., Altınay, 2017; Corey et al., 2013; Voltan-Acar, 2013). During each meeting, the group focused on the problem of one member volunteering to work on it. Other group participants actively contributed by engaging in discussions, offering feedback, and sharing their experiences. Group counseling sessions aim to help group members improve their ability to regulate emotions, restructure maladaptive thoughts, and adopt more adaptive behavioral responses. The cognitive aspect of the program was reflected in the theoretical knowledge of the skills intended for participants to acquire during the sessions. Meanwhile, the emotional component of the program involved participants expressing feelings related to in-session activities. The behavioral component was represented by the exercises conducted during the sessions and the assigned homework tasks.

Students in the experimental group participated in the program for 90 minutes per week over eight weeks. The sessions were conducted face-to-face at the same time, day, and place every week. Each session began with a warm-up activity and discussions on homework experience. Mindfulness exercises were incorporated at the end of each session, and the participants were given homework assignments. Furthermore, at the end of every group session, attendees were encouraged to express their thoughts and feelings regarding their experiences during the session.

The first session of the eight-week program included a general introduction to the group counseling sessions and their rules; besides, group members got to know each other, members' goals were discussed, and basic concepts of CBT and mindfulness were presented. In the second session, a volunteer member's problem was used to demonstrate the relationships among "event-thought-emotion-behavior," and the ABC model was introduced. The ABC model explains how an activating event (A) triggers an individual's beliefs (B), which, in turn, leads to emotions and behaviors (C). In addition, mindful breathing was introduced. The third session focused on information regarding cognitive distortions, and participants learned about and experienced mindfulness meditation. They practiced mindfulness at the end of each subsequent session. The fourth session involved thought analysis and mindfulness meditation. The fifth session focused on cognitive distortion and mindfulness meditation. The sixth session focused on CBT's behavioral experiment exercises and mindfulness meditation. The seventh session involved role-playing focused on each member's goals, conducting behavioral experiments, and practicing mindfulness exercises. The eighth session addressed termination, and the program was evaluated (for more details about the content of each session, see the Appendix). Upon completion of the group counseling program, attendees received a certificate acknowledging their participation.

Data analytic plan

Initial exploratory analyses were performed to assess the assumptions underlying the primary analysis. Nonparametric statistical methods were employed for analysis because the Kolmogorov-Smirnov and Shapiro-Wilk tests indicated that the data did not follow a normal distribution, and the sample size of this study was relatively small. The Wilcoxon signed-rank test was utilized to examine the changes between the pre- and post-intervention scores. The Mann-Whitney U test (MWU) was applied to determine whether a significant difference existed between the pre-test and post-test scores of the experimental and control groups. Effect sizes were examined and interpreted using Cohen's criteria (Cohen, 1988).

Results

Pre-test and Post-test Comparisons of Cognitive Flexibility, Self-Efficacy, and Self-Compassion in the Experimental and Control Groups

To determine if significant changes occurred in the experimental group's pre-test and post-test scores for cognitive flexibility, self-efficacy, and self-compassion, we employed the Wilcoxon signed-rank test.

Table 1

Pre- and Post-Test Comparisons of Outcomes in the Experimental Group

	Pre-Post	*n*	Measurement	*Mean*	*Mean Rank*	*Sum of Ranks*	*z*	*p*
Cognitive flexibility	Negative Ranks	2	Pre-test	71.63	1.50	3.00	-2.10	.035*
	Positive Ranks	6	Post-test	83.25	5.50	33.00		
	Ties	0						
Self-efficacy	Negative Ranks	7	Pre-test	51.75	.00	.00	-2.37	.018*
	Positive Ranks	0	Post-test	63.38	4.00	28.00		
	Ties	1						
Self-compassion	Negative Ranks	7	Pre-test	80.86	0	.00	-2.36	.018*
	Positive Ranks	0	Post-test	107.13	4.00	28.00		
	Ties	1						

Note. *$p < .05$

The findings in Table 1 reveal statistically significant differences between the initial and final assessment scores across the measures. Specifically, our findings suggest that participants in the experimental group experienced significant changes in cognitive flexibility, self-efficacy, and self-compassion from pre-test to post-test.

According to the results of the Wilcoxon signed-rank test for the control group, no significant differences were found between the pre-test and post-test measurements of cognitive flexibility (z = -0.51, p = .61), self-efficacy (z = -0.77, p = .44), and self-compassion (z = -0.63, p = .52).

Post-test Comparisons of Cognitive Flexibility, Self-Efficacy, and Self-Compassion between the Experimental and Control Groups

A series of MWU tests was applied to examine whether there were significant differences between the experimental and control groups before the program was implemented. The MWU results for the pre-test indicated no significant difference between the two groups in terms of cognitive flexibility (p = .25), self-efficacy (p = .56), and self-compassion (p = .39).

Similarly, a series of MWU tests was employed to determine whether there were statistically significant differences between the two groups on the post-test scores. Statistically significant differences between the experimental and control group were found for cognitive flexibility, r = .55, and self-compassion, r = .78. In contrast, no significant group difference in self-efficacy was observed at post-test.

Table 2

Post-Test Comparisons of Outcomes Between Experimental and Control Groups

Scale	Group	*N*	*Mean Rank*	*Sum of Ranks*	*U*	*z*	*p*
Cognitive flexibility	Experimental	8	11.94	95.50	12.50	-2.26	.023*
	Control	9	6.39	57.50			
Self-efficacy	Experimental	8	11.50	92.00	16.00	-1.93	.054
	Control	9	6.78	61.00			
Self-compassion	Experimental	8	13.19	105.50	2.50	-3.22	.001*
	Control	9	5.28	47.50			

Note. *p < .05

Discussion

This study aimed to evaluate the effects of a CBT-based group counseling program combined with mindfulness meditation on three key psychological aspects: cognitive flexibility, self-efficacy, and self-compassion. In this study, participants were taught CBT techniques that enabled them to recognize alternative thinking patterns, thereby enhancing their cognitive flexibility. Additionally, mindfulness exercises were implemented to help participants develop skills in staying present in the moment, which might have contributed to an increase in self-compassion. Moreover, by learning to generate alternative thoughts and behaviors, participants gained awareness of how to improve their self-efficacy, which might have also led to an increase in their overall levels of self-compassion. There are studies in the literature indicating a positive association between self-compassion and self-efficacy (Liao et al., 2021), as well as a significant relationship between unconditional self-acceptance and self-compassion (Faustino et al., 2020). However, the present study did not test the direction of this relationship, and future research is needed to clarify the underlying mechanisms. These findings suggest that integrating CBT techniques and mindfulness practices supports the development of psychological skills and enhances participants' ability to cope with challenges, ultimately improving their emotional well-being. Although these findings are promising, the study design prevents us from definitively concluding that the combination of CBT and mindfulness caused these changes, rather than CBT or mindfulness alone.

The results of the present study showed that participants in the experimental group exhibited significantly improved scores in all three areas at post-test compared to pre-test – a finding that supports our initial hypothesis. In contrast, no significant changes were observed in the control group. This finding suggests that cognitive-behavioral group counseling with mindfulness enhances participants' levels of self-efficacy, cognitive flexibility, and self-compassion.

Regarding our second hypothesis, participants in the experimental group demonstrated higher post-scores in cognitive flexibility and self-compassion compared to those in the control group. However, no significant group differences were observed in self-efficacy post-scores (p = .054). This

nonsignificant result was slightly above the .05 threshold. Considering the limited number of participants in our study, the observed difference might have been significant in a larger sample. Literature consistently reports similar outcomes for interventions based solely on CBT or mindfulness. In a study conducted by Nazarzadeh et al. (2015), researchers observed that college students experienced an increase in cognitive flexibility and a decrease in perfectionism after participating in a cognitive-behavioral group therapy program. The findings of this study are largely in line with prior research highlighting the effectiveness of mindfulness-based and cognitive-behavioral interventions on university students' psychological well-being. For example, the observed increases in self-compassion are consistent with the results of Taylor et al. (2020), who reported enhanced self-compassion and coping self-efficacy among university students following an 8-week mindfulness program. Similarly, Richards and Martin (2012) found that even brief mindfulness-based interventions can significantly enhance self-compassion, and Huberty et al. (2019) observed similar outcomes in students who completed an app-based mindfulness program. The improvements in cognitive flexibility observed in the current study were also supported by Mehr et al. (2021), who reported that divorced women exhibited greater cognitive flexibility and resilience after participating in a mindfulness-based group intervention. Regarding self-efficacy, the present findings align with earlier studies demonstrating that CBT-based group programs can significantly improve self-efficacy in both adolescents and university students (Hyun et al., 2005; Ilkhchi et al., 2011; Sahranavad et al., 2019). Taken together, the consistency of our findings with those of previous studies reinforces the potential benefits of integrating CBT and mindfulness techniques into group interventions designed to enhance self-efficacy, cognitive flexibility, and self-compassion among university students. No contradictory findings emerged in the context of current outcomes.

Our findings revealed a notable change in self-efficacy scores between pre-test and post-test for the experimental group. However, when the post-test results of the experimental and control groups were compared, no substantial differences were observed. There are several possible explanations for this unexpected result. First, many variables can affect self-efficacy. When studies conducted with university students are examined, we see that self-efficacy is related to student engagement, motivational and

cognitive variables (Honicke & Broadbent, 2016), coping strategies (Freire et al., 2020), achievement, effort, and persistence (Ritchie, 2016), and teacher-student interaction (Li & Yang, 2021). Furthermore, a review study by Bartimote-Aufflick et al. (2016), focusing on university students, found that self-efficacy is interconnected with various psychological constructs. These include value, metacognition, intrinsic motivation, self-regulation, use of learning strategies, and locus of control. Emerging adulthood is associated with the exploration of identity, self-focus, a sense of in-betweenness, possibilities/optimism, and instability (Arnett, 2014). During this period, individuals develop self-efficacy by making their own decisions (Twenge, 2014). To strengthen internal validity, subsequent research could include assessments of possible confounding constructs and incorporate them as covariates in analyses. This would help clarify whether the increase in self-efficacy observed in the experimental group from pre-test to post-test was truly due to the intervention or influenced by other factors. One possible explanation for the lack of a significant between-group difference at post-test, despite the within-group improvement observed in the experimental group, is that the magnitude of the observed change may not have been sufficient to exceed time- and measurement-related effects (e.g., testing effects) that may have occurred in the control group. In addition, the relatively small sample size may have resulted in limited statistical power, thereby reducing the ability to detect between-group differences even in the presence of a true effect. Future studies with larger samples may help to better understand these findings.

Conclusion

Overall, our findings contribute to previous research on CBT-based group work involving mindfulness by providing evidence regarding its potential effects on cognitive flexibility, self-efficacy, and self-compassion. Previous studies have reported similar results that applied CBT by incorporating mindfulness-based interventions. For example, Ong et al. (2008) investigated the impact of CBT combined with mindfulness meditation on insomnia. In a related study, Rapgay et al. (2011) explored the outcomes of integrating CBT with mindfulness-based approaches for treating generalized anxiety disorder. However, to our knowledge, no previous study has explored the effects of group counseling that incorporates

both CBT and mindfulness meditation on cognitive flexibility, self-efficacy, and self-compassion among university students in the post-COVID-19 era. This gap underscores the distinctive contributions of this study. While this study offers significant insights, it is important to acknowledge certain limitations that warrant consideration, particularly the small sample size, which represents a significant limitation and should be emphasized when interpreting the results. As the current study did not include a follow-up test, the permanence of its effectiveness could not be examined. Follow-up tests are recommended for future studies. Furthermore, while the experimental group exhibited a notable increase in self-efficacy levels following group counselling sessions, the levels of self-efficacy in the experimental group at post-test did not differ from those in the control group. Therefore, the content of the sessions can be organized in relation to this variable. For example, various activities related to self-control and physical activity, which are related to self-efficacy (Bandura, 1982), can be added to the session content. In our study, the pre- and post-test results of the experimental group revealed a statistically significant difference, whereas no significant difference was observed in the pre- and post-test results of the control group. These findings suggest that the program is effective. Furthermore, since the intervention was administered in a combined format, it is not possible to determine whether the improvements can primarily be attributed to CBT, mindfulness, or the combined effect of both. Future research should use designs with separate groups (CBT+ mindfulness, CBT only, mindfulness only, and control) to assess each component's value and better isolate their individual and combined effects.

Despite these limitations, our results suggest that group counseling sessions based on CBT with mindfulness meditation can positively contribute to students' cognitive flexibility, self-compassion, and self-efficacy levels. The study demonstrated the program’s feasibility (i.e., participants understood the content and were actively engaging in intervention exercises), and the absence of significant challenges during the implementation indicates that the program can be effectively delivered in similar contexts. Further, there are several considerations for practitioners conducting such groups. Notably, the implementation of the intervention by the two leaders was particularly beneficial for facilitating in-session exercises, as one leader guided the activity, while the other observed the

group and provided support to members in need. However, it may be advisable for mindfulness exercises to be consistently led by the same leader, including in a two-leader group process, to enhance group members' engagement and focus. Additionally, displaying materials (e.g., posters listing cognitive distortions) on the wall before and throughout the sessions facilitated participants' recall of these concepts. Overall, our study may provide university counseling centers with useful information on how to expand their services and offer various intervention programs to increase the psychological well-being of emerging adults facing personal challenges, as well as other difficulties, including those related to COVID-19 and the global economic crisis.

Conflict of interest

We have no conflicts of interest to disclose.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

Abedi, H., Matinnia, N., & Yazdi-Ravandi, S. (2023). Investigating the effectiveness of cognitive behavioral group therapy on psycho-social and emotional adaptability and cognitive flexibility in people with multiple sclerosis in Hamedan, Iran. *Neurological Sciences*, *44*(12), 4421–4428. https://doi.org/10.1007/s10072-023-06953-z

Akın, Ü., Akın, A., & Abacı, R. (2007). Self-compassion Scale: The study of validity and reliability. *Hacettepe University Journal of Education*, 33, 1–10.

Aktaş, Y. (1997). Üniversite öğrencilerinin uyum düzeylerinin incelenmesi: uzunlamasına bir çalışma [The adjustment levels of the university: A longitudinal study]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi [Hacettepe University Faculty of Education Journal]*, 13, 107–110.

Alavi, S. S., Ghanizadeh, M., Mohammadi, M. R., Jannatifard, F., Esmaili Alamuti, S., & Farahani, M. (2021). The effects of cognitive-behavioral group therapy for reducing symptoms of internet addiction disorder and promoting quality of life and mental health. *Trends in Psychiatry and Psychotherapy, 43*, 47–56. https://doi.org/10.47626/2237-6089-2020-0010

Alidina, S. (2020). *Mindfulness for dummies* (3rd ed.). John Wiley & Sons.

Altınay, D. (2017). *Psikodrama 400 Isınma Oyunu ve Yardımcı Teknikler [Psychodrama 400 Warming Game and Auxiliary Techniques]*. Epsilon.

Arnett, J. J. (2014). *Emerging Adulthood: The Winding Road from the Late Teens Through the Twenties* (2nd edn). Oxford University PressNew York. https://doi.org/10.1093/acprof:oso/9780199929382.001.0001

Aslan, Ş., & Turk, F. (2022). Bilişsel esneklik ve psikolojik esneklik kavramlarının karşılaştırılması [Comparison of Concepts of Cognitive Flexibility and Psychological Flexibility]. *Psikiyatride Güncel Yaklaşımlar* [Current Approaches in Psychiatry], *14*(1), 119–130. https://doi.org/10.18863/pgy.917360

Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice*, *10*(2), 125–143. https://doi.org/10.1093/clipsy.bpg015

Bahrami, A., Tabatabaee, S. M., & Delavarpour, M. (2022). Effectiveness of mindfulness training (with music) on working memory and cognitive flexibility in children with learning disabilities. *Journal of Learning Disabilities*, *11*(4), 6–20. https://dx.doi.org/10.22098/jld.2022.9667.1960

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*(2), 122–147. https://doi.org/10.1037/0003-066X.37.2.122

Bandura, A. (2000). Exercise of Human Agency Through Collective Efficacy. *Current Directions in Psychological Science*, *9*(3), 75–78. https://doi.org/10.1111/1467-8721.00064

Bartimote-Aufflick, K., Bridgeman, A., Walker, R., Sharma, M., & Smith, L. (2016). The study, evaluation, and improvement of university student self-efficacy. *Studies in Higher Education, 41*(11), 1918–1942. http://dx.doi.org/10.1080/03075079.2014.999319

Beck, J. S. (2016). *Cognitive behavior therapy: Basics and beyonds*. The Guilford Press.

Cañas, J. J., Fajardo, I., & Salmerón, L. (2006). Cognitive flexibility. *International Encyclopedia of Ergonomics and Human Factors*, *1*(3), 297–301. https://doi.org/10.13140/2.1.4439.6326

Cañas, J., Quesada, J. F., Antolí, A., & Fajardo, I. (2003). Cognitive flexibility and adaptability to environmental changes in dynamic complex problem-solving tasks. *Ergonomics*, *46*(5), 482–501. https://doi.org/10.1080/0014013031000061640

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd Ed.). Lawrence Erlbaum Associates, Publishers.

Corey, M. S., Corey, G., & Corey, C. (2013). *Groups: Process and practice*. Cengage Learning.

Coşkun, Y. (2018). Üniversite öğrencilerinin psikolojik danışma ve rehberlik ihtiyaç örüntüleri ve başvurdukları yardım kaynakları [University students' need patterns regarding psychological counseling and guidance services and sources of help they apply]. *Electronic Turkish Studies*, *13*(2), 213–228. http://dx.doi.org/10.7827/TurkishStudies.12898

Cully, J. A., & Teten, A. L. (2008). *A therapist's guide to brief cognitive behavioral therapy*. Department of Veterans Affairs, South Central Mental Illness Research, Education, and Clinical Center (MIRECC).

Dennis, J. P., & Vander Wal, J. S. (2010). The Cognitive Flexibility Inventory: Instrument Development and Estimates of Reliability and Validity. *Cognitive Therapy and Research*, *34*(3), 241–253. https://doi.org/10.1007/s10608-009-9276-4

Faustino, B., Vasco, A. B., Silva, A. N., & Marques, T. (2020). Relationships between emotional schemas, mindfulness, self-compassion and unconditional self-acceptance on the regulation of psychological needs. *Research in Psychotherapy: Psychopathology, Process and Outcome*, *23*(2). https://doi.org/10.4081/ripppo.2020.442

Fazeli, M., Ehteshamzadeh, P., & Hashemi, S. E. (2015). The effectiveness of cognitive behavior therapy on cognitive flexibility of depressed people. *Thoughts and Behavior in Clinical Psychology*, *9*(34), 27–36.

Freire, C., Ferradás, M. D. M., Regueiro, B., Rodríguez, S., Valle, A., & Núñez, J. C. (2020). Coping Strategies and Self-Efficacy in University Students: A Person-Centered Approach. *Frontiers in Psychology*, *11*, 841. https://doi.org/10.3389/fpsyg.2020.00841

Gelles, L. A., Lord, S. M., Hoople, G. D., Chen, D. A., & Mejia, J. A. (2020). Compassionate Flexibility and Self-Discipline: Student Adaptation to Emergency Remote Teaching in an Integrated Engineering Energy Course during COVID-19. *Education Sciences*, *10*(11), 304. https://doi.org/10.3390/educsci10110304

Germer, C. K. (2009). *The mindful path to self-compassion: Freeing yourself from destructive thoughts and emotions.* Guilford Press.

Hamedani, K. H., Amani, R., & Vasel, M. Y. (2023). The Effectiveness of Enhanced Cognitive-Behavioral Group Therapy on Negative Perfectionism, Self-Criticism, and Self-Compassion. *International Journal of Cognitive Therapy*, *16*(3), 375–389. https://doi.org/10.1007/s41811-023-00167-z

Heydari, M. S., Dortaj, F., & Cheliche, K. S. (2022). Predicting COVID-19 anxiety based on cognitive flexibility mediated by self-compassion in students. *International Journal of Health Sciences,6*(S1), 12661–12672. https://doi.org/10.53730/ijhs.v6nS1.8183

Honicke, T., & Broadbent, J. (2016). The relation of academic self-efficacy to university student academic performance: A systematic review. *Educational Research Review, 17*, 63–84. https://doi.org/10.1016/j.edurev.2015.11.002

Huberty, J., Green, J., Glissmann, C., Larkey, L., Puzia, M., & Lee, C. (2019). Efficacy of the Mindfulness Meditation Mobile App "Calm" to Reduce Stress Among College Students: Randomized Controlled Trial. *JMIR mHealth and uHealth*, *7*(6), e14273. https://doi.org/10.2196/14273

Hyun, M. S., Chung, H.I.C., & Lee, Y. J. (2005). The effect of cognitive–behavioral group therapy on the self-esteem, depression, and self-efficacy of runaway adolescents in a shelter in South Korea. *Applied Nursing Research*, *18*(3), 160–166. https://doi.org/10.1016/j.apnr.2004.07.006

Ilkhchi, S. V., Poursharifi, H., & Alilo, M. M. (2011). The Effectiveness of Cognitive-Behavioral Group Therapy on Self-Efficacy and Assertiveness Among Anxious Female Students of High Schools. *Procedia - Social and Behavioral Sciences*, *30*, 2586–2591. https://doi.org/10.1016/j.sbspro.2011.10.506

Iskender, M. (2009). The Relationship Between Self-Compassion, Self-Efficacy, and Control Belief about Learning in Turkish University Students. *Social Behavior and Personality: An International Journal*, *37*(5), 711–720. https://doi.org/10.2224/sbp.2009.37.5.711

Jin, Y., Zhang, M., Wang, Y., & An, J. (2020). The relationship between trait mindfulness, loneliness, regulatory emotional self-efficacy, and subjective well-being. *Personality and Individual Differences, 154,* Article 109650. https://doi.org/10.1016/j.paid.2019.109650

Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Science and Practice, 10,* 144–156. https://doi.org/10.1093/clipsy/bpg016

Kabat-Zinn, J. (2012). *Mindfulness for beginners: Reclaiming the present moment— and your life*. Sounds True.

Kurtoğlu, M., & Başgül, S. S. (2023). The Effects of Group Based Cognitive Behavioral Therapy on Self-Compassion, Social Anxiety and Ruminative Thought Style of Turkish Youth Transitional Age: A Controlled Study on University Students. *Psychiatry and Behavioral Sciences*, *13*(1), 13. https://doi.org/10.5455/PBS.20211205105803

Latorre, C., Leppma, M., Platt, L. F., Shook, N., & Daniels, J. (2023). The relationship between mindfulness and self-compassion for self-assessed competency and self-efficacy of psychologists-in-training. *Training and Education in Professional Psychology*, *17*(2), 213–220. https://doi.org/10.1037/tep0000395

Lee, H. J., & Lee, N. (2022). Students' college life adaptation experiences in the accelerated second-degree bachelor of science in nursing program in South Korea. *The Journal of Korean Academic Society of Nursing Education*, *28*(2), 167–178. https://doi.org/10.5977/jkasne.2022.28.2.167

Li, J., Xu, C., Wan, K., Liu, Y., & Liu, L. (2023). Mindfulness-based interventions to reduce anxiety among Chinese college students: A systematic review and meta-analysis. *Frontiers in Psychology*, *13*, 1031398. https://doi.org/10.3389/fpsyg.2022.1031398

Li, L., & Yang, S. (2021). Exploring the Influence of Teacher-Student Interaction on University Students' Self-Efficacy in the Flipped Classroom. *Journal of Education and Learning*, *10*(2), 84–90. https://doi.org/10.5539/jel.v10n2p84

Liao, K. Y.-H., Stead, G. B., & Liao, C.-Y. (2021). A Meta-Analysis of the Relation Between Self-Compassion and Self-Efficacy. *Mindfulness*, *12*(8), 1878–1891. https://doi.org/10.1007/s12671-021-01626-4

Liverpool, S., Moinuddin, M., Aithal, S., Owen, M., Bracegirdle, K., Caravotta, M., Walker, R., Murphy, C., & Karkou, V. (2023). Mental health and wellbeing of further and higher education students returning to face-to-face learning after Covid-19 restrictions. *PLOS ONE*, *18*(1), e0280689. https://doi.org/10.1371/journal.pone.0280689

Locke, B., Wallace, D., & Brunner, J. (2016). Emerging Issues and Models in College Mental Health Services. *New Directions for Student Services*, *2016*(156), 19–30. https://doi.org/10.1002/ss.20188

Martin, M. M., & Rubin, R. B. (1995). A New Measure of Cognitive Flexibility. *Psychological Reports*, *76*(2), 623–626. https://doi.org/10.2466/pr0.1995.76.2.623

Martin, M. M., Staggers, S. M., & Anderson, C. M. (2011). The Relationships Between Cognitive Flexibility with Dogmatism, Intellectual Flexibility, Preference for Consistency, and Self-Compassion. *Communication Research Reports*, *28*(3), 275–280. https://doi.org/10.1080/08824096.2011.587555

Mehr, M. A., Abad, M. J. A. E., & Moeenizadeh, M. (2021). The effectiveness of mindfulness-based stress reduction on anxiety, cognitive flexibility and resilience of divorced mothers. *Quarterly Journal of Women and Society Spring*, *12*(45), 57–69. https://doi.org/10.30495/JZVJ.2021.4564

Mitchell, J. H., Newall, C., Broeren, S., & Hudson, J. L. (2013). The role of perfectionism in cognitive behaviour therapy outcomes for clinically anxious children. *Behaviour Research and Therapy*, *51*(9), 547–554. https://doi.org/10.1016/j.brat.2013.05.015

Moeini, M., Sarikhani-Khorrami, E., & Ghamarani, A. (2019). The effects of self-compassion education on the self-efficacy of the clinical performance of nursing students. *Iranian Journal of Nursing and Midwifery Research*, *24*(6), 469. https://doi.org/10.4103/ijnmr.IJNMR_77_18

Nazarzadeh, R. S., Fazeli, M., Aval, M. M., & Shourch, R. M. (2015). Effectiveness of Cognitive-Behavior Therapy on Cognitive Flexibility in Perfectionist. *Psychology*, *6*(14), 1780–1785. https://doi.org/10.4236/psych.2015.614174

Neff, K. D. (2003). The Development and Validation of a Scale to Measure Self-Compassion. *Self and Identity*, *2*(3), 223–250. https://doi.org/10.1080/15298860309027

Ong, J. C., Shapiro, S. L., & Manber, R. (2008). Combining Mindfulness Meditation with Cognitive-Behavior Therapy for Insomnia: A Treatment-Development Study. *Behavior Therapy*, *39*(2), 171–182. https://doi.org/10.1016/j.beth.2007.07.002

Özer, Ö., & Yalçın, İ. (2020). Bilişsel-davranışçı terapiye dayalı psiko-eğitim programının üniversite öğrencilerinin sosyal anksiyete düzeylerine etkisi [The Effect of Cognitive Behavioral Therapy Based Psycho-Education

Program Towards Social Anxiety Level of University Students]. *Uluslararası Karamanoğlu Mehmetbey Eğitim Araştırmaları Dergisi [International Journal of Karamanoglu Mehmetbey Educational Research]*, *2*(2), 161–168. https://doi.org/10.47770/ukmead.788859

Parcover, J., Coiro, M. J., Finglass, E., & Barr, E. (2018). Effects of a Brief Mindfulness Based Group Intervention On College Students. *Journal of College Student Psychotherapy*, *32*(4), 312–329. https://doi.org/10.1080/87568225.2017.1407722

Parvizi, G., & Özabacı, N. (2022). Üniversite öğrencilerinin psikolojik iyi oluş ve yaşam doyumlarının yordayıcısı olarak bilişsel esnekliğin rolü [The Role of Cognitive Flexibility as a Predictor of University Students' Psychological Well-being and Life Satisfaction]. *Adnan Menderes Üniversitesi Eğitim Fakültesi Eğitim Bilimleri Dergisi [Adnan Menderes University Faculty of Education Journal of Educational Sciences], 13*(1), 65-81.

Pedrelli, P., Nyer, M., Yeung, A., Zulauf, C., & Wilens, T. (2015). College Students: Mental Health Problems and Treatment Considerations. *Academic Psychiatry*, *39*(5), 503–511. https://doi.org/10.1007/s40596-014-0205-9

Rapgay, L., Bystritsky, A., Dafter, R. E., & Spearman, M. (2011). New Strategies for Combining Mindfulness with Integrative Cognitive Behavioral Therapy for the Treatment of Generalized Anxiety Disorder. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, *29*(2), 92–119. https://doi.org/10.1007/s10942-009-0095-z

Richards, D., & Martin, W. (2012). The effects of a brief mindfulness intervention on self–compassion among undergraduate college students. *VISTAS, 1*(3), 1–10.

Ritchie, L. (2016). *Fostering self-Efficacy in Higher Education Students.* Palgrave MacMillan. https://doi.org/10.1007/978-1-137-46378-4

Sadeghi, M., Shafiei, M., & Mobasher, A. (2018). Effect of self-compassion training on cognitive flexibility and meaning in life in individuals faced with mine explosion leading to maim. *Iranian Journal of War and Public Health (Tebe-E-Janbaz), 10*(2), 61–67. https://doi.org/10.29252/ijwph.10.2.61

Sahranavard, S., Esmaeili, A., Salehiniya, H., & Behdani, S. (2019). The effectiveness of group training of cognitive behavioral therapy-based stress management on anxiety, hardiness and self-efficacy in female medical students. *Journal of education and health promotion*, *8*, 49. https://doi.org/10.4103/jehp.jehp_327_18

Salimi, N., Gere, B., Talley, W., & Irioogbe, B. (2023). College Students Mental Health Challenges: Concerns and Considerations in the COVID-19 Pandemic. *Journal of College Student Psychotherapy*, *37*(1), 39–51. https://doi.org/10.1080/87568225.2021.1890298

Sapmaz, F., & Doğan, T. (2013). Assessment of cognitive flexibility: Reliability and validity studies of Turkish version of the Cognitive Flexibility Inventory. *Ankara University Journal of Faculty of Educational Sciences (JFES)*, *46*(1), 143-162. https://doi.org/10.1501/Egifak_0000001278

Sharma, P. K., & Kumra, R. (2022). Relationship between mindfulness, depression, anxiety and stress: Mediating role of self-efficacy. *Personality and Individual Differences*, *186*, 111363. https://doi.org/10.1016/j.paid.2021.111363

Sherer, M., Maddux, J. E., Mercandante, B., Prentice-Dunn, S., Jacobs, B., & Rogers, R. W. (1982). The Self-Efficacy Scale: Construction and Validation. *Psychological Reports*, *51*(2), 663–671. https://doi.org/10.2466/pr0.1982.51.2.663

Son, C., Hegde, S., Smith, A., Wang, X., & Sasangohar, F. (2020). Effects of COVID-19 on College Students' Mental Health in the United States: Interview Survey Study. *Journal of Medical Internet Research*, *22*(9), e21279. https://doi.org/10.2196/21279

Souza, L. K. D., & Hutz, C. S. (2016). Self-Compassion in Relation to Self-Esteem, Self-Efficacy and Demographical Aspects. *Paidéia (Ribeirão Preto)*, *26*(64), 181–188. https://doi.org/10.1590/1982-43272664201604

Stahl, B., & Goldstein, E. (2019). *A mindfulness-based stress reduction workbook*.

Taylor, S. B., Kennedy, L. A., Lee, C. E., & Waller, E. K. (2022). Common humanity in the classroom: Increasing self-compassion and coping self-efficacy through a mindfulness-based intervention. *Journal of American College Health*, *70*(1), 142–149. https://doi.org/10.1080/07448481.2020.1728278

Tovilović, S., Novović, Z., Mihić, L., & Petrović, T. (2022). Guided Mindfulness-Acceptance Self-Help Intervention for Dysphoric Students: Preliminary Findings. *Primenjena Psihologija, 15*(4), 473–506. https://doi.org/10.19090/pp.v15i4.2396

Türkçapar, M. H. (2018). *Bilişsel davranışçı terapi temel ilke ve uygulamalar*. Epsilon.

Twenge, J. M. (2014). *Generation me-revised and updated: Why today's young Americans are more confident, assertive, entitled--and more miserable than ever before*. Simon and Schuster.

Voltan-Acar, N. (2013). *Grupla psikolojik danışmada alıştırmalar- deneyler [Exercises and experiments in group counseling]*. Nobel.

Von Keyserlingk, L., Yamaguchi-Pedroza, K., Arum, R., & Eccles, J. S. (2022). Stress of university students before and after campus closure in response to COVID-19. *Journal of community psychology*, *50*(1), 285–301. https://doi.org/10.1002/jcop.22561

Williams, M., & Penman, D. (2012). *Mindfulness: An eight-week plan for finding peace in a frantic world.* Rodale Books.

Yıldırım, F., & İlhan, İ. Ö. (2010). Genel Öz Yeterlilik Ölçeği Türkçe formunun geçerlilik ve güvenilirlik çalışması [The Validity and Reliability of the General Self-Efficacy Scale-Turkish Form]. *Türk Psikiyatri Dergisi [Turkish Psychiatry Journal]*, *21*(4), 301–308.

Yıldız, M., & Aslan, M. (2017). Üniversite öğrencilerinde bilişsel davranışçı grupla psikolojik danışmanın depresif belirtilere etkisi [The effects of cognitive behavioral group counseling among university students on depressive symptoms]. *Ihlara Eğitim Araştırmaları Dergisi [Ihlara Journal of Educational Research], 2*(1), 38–48.

Zeidi, I. M., Divsalar, S., Morshedi, H., & Alizadeh, H. (2020). The Effectiveness of Group Cognitive-Behavioral Therapy on General Self-Efficacy, Self-Control, and Internet Addiction Prevalence Among Medical University Students. *Asian Journal of Social Health and Behavior*, *3*(3), 93–102. https://doi.org/10.4103/SHB.SHB_20_20

Appendix

1st Session: Gaining insight into the group counseling program's objectives, organization, and methodology, Detailing the process for conducting sessions, Determining group rules, Determining the expectations, Setting individual goals Giving brief information about mindfulness and CBT **Exercise:** Blind walk	**2nd Session:** Examining the relationship between "situation-thought-feeling-behavior" on a volunteer member's problem, Explaining automatic thoughts, Recognizing the significance of breath and clarifying the notion of mindful awareness, **Exercises:** A three-minute mindfulness meditation **Homework:** A three-minute mindfulness meditation, Situation-thoughts-emotion-behavior worksheet.
3rd Session: Identifying and understanding cognitive distortions **Exercises:** Willow in the wind exercise, Mindfulness meditation (adding number at the end of breathing out) **Homework:** A four-minute mindfulness meditation exercise, Situation-thoughts- emotion-behavior worksheet.	**4th Session:** Warm up activity, Control of homework, Identifying alternative thoughts, Cognitive Restructuring of Automatic Thoughts **Exercises:** Group sculpture, breath counting exercise **Homework:** An eight-minute mindfulness meditation exercise
5th Session: The cognitive distortions are acted out by the group members and the volunteer member who shares the problem generates alternative thoughts against these cognitive distortions. **Exercises:** Deserted island exercise, breath counting exercise	**6th Session:** Establishing an exposure hierarchy linked to objectives, Designing behavior experiment with behavior experiment guide form, Executing the behavioral experiment with role-playing **Exercises:** a 16-minute breathing mindfulness meditation exercise

Homework: a 12-minute mindfulness meditation exercise	**Homework:** Behavioral experiment worksheet and recording chart, 16-minute breathing mindfulness
7th Session: Executing the behavioral experiment with role-playing **Exercises:** a 20-minute breathing mindfulness meditation exercise **Homework:** Behavioral experiment recording chart, 20-minute mindfulness meditation exercise	**8th Session:** Concluding all sessions, Gathering program evaluations and perspectives, Conducting final assessment at program completion, Distributing certificates of attendance and wrapping up **Exercise:** Love bombing

Primenjena psihologija
Vol. 19, No. 1, pp. 57–86, 2026

Research Article

Reinforcement sensitivity and tripartite authenticity in the prediction of aggressiveness

Kristina Ranđelović[1]✉, Milica Tasković[1]

[1] *Department of Psychology, Faculty of Philosophy, University of Niš, Serbia*

ABSTRACT

The primary aim of this study was to examine personality traits (from the revised Reinforcement Sensitivity Theory) and authenticity (according to the tripartite conception) as predictors of aggressiveness (anger, vengefulness, dominance, and hostility), as well as to determine the interaction effects of authenticity on the relationship between personality traits and aggressiveness. The sample comprised 460 participants (82.8% female, M_{age} = 25). Findings showed rRST traits, particularly the Behavioral Inhibition System (BIS) and Behavioral Activation System (BAS), significantly predict individual differences in authenticity, with a low BIS and high BAS combination proving optimal for authentic living. Authenticity dimensions, such as self-alienation and acceptance of external influences, also emerged as significant predictors of various aggressiveness dimensions. Crucially, moderation analyses revealed that authenticity complexly modulates the associations between rRST traits and aggressiveness. These interactions demonstrated nuanced effects; for example, authenticity could intensify anger responses to defensive behaviors or redirect BAS-driven energy towards dominance when authentic living was low. This research offers significant insights into the intricate interplay between reinforcement sensitivity, authenticity, and aggressiveness, enriching theoretical understanding and suggesting potential avenues for future research.

Keywords: reinforcement sensitivity, tripartite authenticity, aggressiveness

UDK: 159.923:616.89-008.444.9
DOI: 10.19090/pp.v19i1.2607
Received: 05.02.2025.
Revised: 22.07.2025.
Accepted: 07.10.2025.

✉ Corresponding author's email: kristina.randjelovic@filfak.ni.ac.rs

Introduction

The consideration of authenticity as an important aspect of personality has long been present among psychologists of various theoretical perspectives and fields – psychodynamic, humanistic, existential, social, positive, and clinical psychology (Horney, 1951; Winnicott, 1965; Rogers, 1961; Maslow, 1968; Deci & Ryan, 1985; Yalom, 1980; Kernis & Goldman, 2006; Sheldon, 2004; Joseph & Linley, 2005). However, it is only in recent decades that there has been a rapid increase in research on authenticity, which is reflected in hundreds of published scientific articles (Hicks et al., 2019). Conceptual ambiguities and the lack of adequate measures of authenticity have made earlier research confusing (Harter, 2002). In an effort to resolve this, Wood and colleagues (Wood et al., 2008) relied on Rogers' theory (person-centered approach) (Rogers, 1961) and Barrett-Lennard's (Barrett-Lennard, 1998) tripartite conception of authenticity. Accordingly, these authors proposed a tripartite model of authenticity with accompanying operationalization – the Authenticity Scale (Wood et al., 2008). The model stands out for its comprehensiveness and includes three aspects: authentic living, self-alienation, and acceptance of external influences.

Authentic living represents a life true to oneself; that is, it includes behaviors that reflect the real self in different social contexts. *Self-alienation* describes an inadequate experience of identity due to a lack of self-knowledge and contradictions between the conscious experience of oneself and real experience. *Acceptance of external influences* denotes a person's belief that they must adapt to the expectations of others. In essence, an authentic person is one whose awareness of themselves (low self-alienation) coincides with their behavior (high authentic living) and resistance to external influences. Traditionally, studies, such as those conducted by Wood et al. (2008) and Kernis and Goldman (2006), define authenticity as a relatively stable personality trait. Alternatively, Sedikides et al. (2017) conceptualize authenticity as a transient state, characterized by an experience of psychological balance and alignment with one’s core identity.

Research suggests that authenticity, according to the tripartite model, is a unique personality trait, explaining only a small portion of basic personality traits from models like the Big Five (11-13%), Gray's (5.7%), and

Cloninger's (18%) (Wood et al., 2008; Pinto et al., 2011). Authenticity and Honesty-Humility from the HEXACO model should be partly overlapping constructs, but research is unclear on this issue. Some studies have shown that they are separate traits (Wood et al., 2008), while others have found a link between the two? (Maltby et al., 2012). In addition to the evident distinctiveness of authenticity and personality traits from certain personality models, research has consistently shown that greater authenticity is associated with higher extraversion, agreeableness, conscientiousness, and openness, as well as lower neuroticism (e.g., Grégoire et al., 2014; Wood et al., 2008). Also, correlations have been established between all three aspects of authenticity and certain personality dimensions from Cloninger's model – people who avoid punishment tend less towards authentic living, and more towards environmental influence and self-alienation. Conversely, those with expressed reward dependence, self-directedness, and self-transcendence tend towards authenticity and are less susceptible to external influences and self-alienation. Interestingly, the dimension of persistence is positively associated only with authentic living, and negatively with its opposite – self-alienation. Further, research has shown that, from the original Reinforcement Sensitivity Theory (oRST; Gray, 1987), only BIS-anxiety and BIS-fear correlate with all three aspects of authenticity, negatively with authentic living, and positively with the remaining two aspects (Pinto et al., 2011). More precisely, only BIS-anxiety stood out as a significant predictor (in the negative direction) of the authenticity measure operationalized through the total score on the Authenticity Scale (Wood et al., 2008).

However, scientific papers currently do not link the revised Reinforcement Sensitivity Theory (rRST; Gray & McNaughton, 2000) and authenticity. Considering the conceptual differences between the original and revised Gray's theory, studying the relationship between personality systems from the rRST and authenticity could provide significant insights into individual differences in authenticity. In the revised theory, the Behavioral Inhibition System (BIS) represents a defensive approach system, whose functions are threat assessment, behavior control (activating or inhibiting reactions from other systems), and conflict resolution. The BIS is associated with anxiety and is responsible for individual differences in the subjective assessment of threat, which does not have to be based on reality

(Smederevac et al., 2014). The Fight-Flight-Freeze System (FFFS) is a defensive avoidance system, which is also associated with negative emotionality and negative reinforcement. The FFFS can be activated by a wide range of aversive stimuli, and reactions to them can be manifested through Fight (anger), Flight (fear), and Freeze (panic). Essentially, the main role of the FFFS is to protect the individual from danger, and the reactions depend on the social situation and the subjective assessment of the threat (Krupić & Dinić, 2017; Ranđelović, 2016; Ranđelović et al., 2018). The Behavioral Activation System (BAS) is sensitive to all forms of reward (including avoiding punishment). Its activation is recognized in active and exploratory behavior, but also in difficulties with impulse control, impulsive, risky behavior, and an increased need for excitement (Smederevac et al., 2009). At the level of personality traits, the BAS is associated with impulsivity (Smederevac et al., 2014), extraversion, and positive emotions (Depue & Collins, 1999; Smillie et al., 2006).

In addition to researching authenticity in the context of the prominent psychobiological theory of personality, it is important to explain and understand authenticity in relation to some of the more specific personality traits associated with interpersonal functioning. One such trait is aggressiveness. The reason for choosing this trait is twofold. First, aggressiveness is not singled out as a separate personality dimension within the rRST. Second, a reduced tendency towards aggressive behavior is an indicator of greater psychological maturity, i.e., authenticity.

Although often used interchangeably, aggression and aggressiveness are different concepts. Aggression refers to any attempt to harm someone against their will (Allen & Anderson, 2017), while aggressiveness is a dispositional tendency towards such aggressive behavior in different situations and over time (Chester & DeWall, 2013). Aggressiveness can be divided into four dimensions (Dinić et al., 2014), which represent different patterns of connection with forms of aggression and personality traits. These are: anger, vengefulness, dominance, and hostility. *Anger* involves impulsive reactions, low self-esteem, and the tendency to interpret others' behavior as provocation. It manifests through a spectrum of intensity – from mild irritation to severe rage – and is a core component of affective aggressiveness. *Vengefulness* represents a tendency towards revenge, which can be

manifested impulsively and deliberately. In people with more pronounced vengefulness, predicting the triggers of revenge is difficult because they are hypersensitive to provocation and react to motives that may be insignificant to others. *Dominance* represents a tendency towards more subtle and masked forms of aggression, as it is usually unaccompanied by emotional reactions. It is also expressed through a need for control and the imposition of one's opinions. *Hostility* indicates a hostile attitude towards others, which is manifested through passive aggression, a tendency towards gossip, and low tolerance for the mistakes of others (Dinić et al., 2014).

Aggressiveness, although not a separate personality dimension within the rRST model, is part of the Fight/Flight/Freeze system. Research links proactive aggression with BAS (Carver, 2004; Corr & Perkins, 2009; Harmon-Jones & Sigelman, 2001), while specific components such as BAS-Drive and BAS-Fun Seeking have been shown to positively predict trait anger and aggressive responses to provocation (Cooper et al., 2008). Both BIS and BAS correlate with anger, but they differently affect its expression: BAS is associated with the manifestation of anger, while BIS inhibits it (Smits & Kuppens, 2005). The Fight subsystem is associated with reactive aggression, which is triggered by BAS activation. In addition, BIS is associated with avoidance behavior, in contrast to the BAS's approach-oriented nature (Krupić et al., 2016). Studies also suggest that physical aggression is positively correlated with BAS and negatively with BIS (Harmon-Jones, 2003).

According to the humanistic conception of personality, specifically Rogers' theory (1961), the basic direction of personality development is reflected in self-actualization. One of the conditions for healthy development is the congruence between self-awareness and one's own behavior. In other words, according to Rogers (1961), to be a person means to live authentically and to develop one's potential in a constructive way. People who do not succeed in this become anxious, fearful, defensive, and are more prone to dissatisfaction, maladjustment, dysfunctionality, aggressiveness, and the development of psychopathology, which has been empirically confirmed. Authenticity is associated with higher self-esteem, life satisfaction, positive affectivity, autonomy, personal growth, purpose in life, self-acceptance, healthy relationships with others, but also with lower negative affectivity,

stress/distress (e.g., Grégoire et al., 2014; Grijak, 2017, 2018; Naumova & Naumov, 2022; Rivera et al., 2019; Thomaes et al., 2017; Wood et al., 2008), self-handicapping behavior (e.g., Akin & Akin, 2014) and less aggression (e.g., McCormick et al., 2015; Pinto et al., 2012). In the research by Pinto et al. (2012), a significant positive and moderate correlation was recorded only between self-alienation and anger as a personality trait, while in the study by McCormick et al. (2015), a finding was obtained that supports a low negative correlation between authenticity (as a total score) and internalized aggression.

Current study

While the positive link between authenticity and general well-being is well-documented (e.g., Grijak, 2018; Rivera et al., 2019; Wood et al., 2008), its connection to aggressiveness as a personality trait remains a relatively unexplored field. Addressing this gap is crucial for a deeper understanding of individual differences in aggressive tendencies. Importantly, no studies examine the complex, interactional relationships between rRST personality traits, authenticity, and aggressiveness, making this study vital.

We conceptualize authenticity as a moderator in the relationship between rRST personality traits and aggressiveness. This is based on authenticity's role as a stable disposition for emotional self-regulation and internal experience integration (Kernis & Goldman, 2006; Wood et al., 2008). As a distinct construct (Pinto et al., 2011; Wood et al., 2008), authenticity is linked to enhanced emotional regulation and resilience (Kernis & Goldman, 2006; Rogers, 1961; Wood et al., 2008). This regulatory capacity provides a theoretical basis for positing that authenticity may attenuate the link between BIS (associated with anxiety and threat assessment) and aggressive dispositions, as well as the link between FFFS (associated with fear, anger, and panic responses to danger) and aggressive dispositions. Theoretically, low authenticity may conversely amplify aggressiveness due to weakened self-regulation (Wood et al., 2008). Authenticity is also hypothesized to influence threat appraisal (Harter, 2002; Kernis & Goldman, 2006), potentially preventing BIS and FFFS reactivity from escalating into aggression. For high BAS sensitivity (reward-seeking, risk-taking), authenticity may be expected to play a balancing role by channeling

motivational energy toward prosocial goals, thereby mitigating maladaptive aggression (Rogers, 1961; Wood et al., 2008).

Despite a lack of direct empirical evidence on authenticity's moderating role with rRST traits and aggressiveness, our study builds on a robust theoretical foundation of authenticity's link to emotional integration and psychological adjustment. Our conceptual model offers a novel theoretical extension to the literature on reinforcement sensitivity, authenticity, and aggressiveness.

This research aims to: 1) Predict authenticity aspects (self-alienation, authentic living, acceptance of external influences) based on rRST personality traits; 2) Examine how authenticity aspects predict aggressiveness dimensions (anger, vengefulness, dominance, hostility) and 3) Determine if authenticity aspects moderate[1] the relationship between personality traits and aggressiveness. Based on theory and prior findings, we expect BIS and FFFS to show negative associations with authentic living and positive associations with self-alienation and acceptance of external influence (Pinto et al., 2011). BAS is expected to show the opposite pattern – a positive association with authentic living and a negative with self-alienation and acceptance of external influences. This is supported by research linking Cloninger's Reward Dependence (conceptually close to BAS) to higher authenticity and less self-alienation/external influence (Pinto et al., 2011). Furthermore, authentic living should negatively relate to all aggressiveness dimensions, while self-alienation and acceptance of external influence should relate positively (McCormick et al., 2015; Pinto et al., 2012). Given the absence of prior direct empirical studies on interaction effects, we hypothesize no significant interaction effects between rRST traits and authenticity aspects in predicting aggressiveness.

[1] While the terms interaction and moderation are often used interchangeably in research, there is a subtle difference between them (Međedović, 2013). Interaction is a broader term that encompasses all types of relationships between variables, while moderation primarily refers to causal relationships (Wu & Zumbo, 2008). However, given their conceptual closeness and identical statistical analysis (Međedović, 2013), these terms will be used as synonyms in this paper.

Method

Sample and procedure

The sample of this study included 460 participants from the general population in Serbia (predominantly students (66.4%) and females (82.8%), aged from 18 to 68 years (*M* = 25.32; *SD* = 8.19). Regarding the level of education, the largest number of participants completed secondary school (66.4%); 30.7% had a college degree, master's degree, or doctorate, while 1.3% had primary education, and 1.5% had higher education. According to marital status, the majority of participants reported not being in a relationship at the time of the study participation (50.1%), 28.8% were in a relationship but did not live with a partner, 13.7% were married, while 6.8% lived in a cohabiting relationship, and 0.7% reported being divorced. Participants' average satisfaction with their household's material situation was 3.36 (*SD* = 0.98).

The research was conducted online, from June to October 2022, by asking participants to complete an online questionnaire (which was shared via social networks and personal contacts) created using the Google Forms application. As part of the battery of instruments that were given in this research, a single-item marker was included to check the attention of the respondents, that is, to check the validity of the respondents' answers ("Please, as a sign that you are carefully reading the claims, mark as the answer 'I agree' or '4'.").

Participation in the research was anonymous and voluntary. Before completing the questionnaire, all participants provided informed consent. The study was approved by the Ethics Committee of the Department of Psychology of the Faculty of Philosophy in Niš (number 3-2022).

Instruments

Reinforcement Sensitivity Questionnaire (RSQ)

The Reinforcement Sensitivity Questionnaire (RSQ; Smederevac et al., 2014) consists of 29 items that measure five different systems within the revised Reinforcement Sensitivity Theory. These are: Behavioral Activation

System (BAS) (6 items, e.g., "When I want something, I never think about possible obstacles."), Behavioral Inhibition System (BIS) (7 items, e.g., "I frequently worry about being criticized.") and the Fight/Flight/Freeze System (FFFS) – Fight (6 items, e.g., "When someone criticizes me, I don't hold back."), Flight (5 items, e.g., "When I encounter aggressive people, I try to get away.") and Freeze (5 items, e.g., "I just 'freeze' when I get really scared."). Respondents were asked to rate on a four-point Likert scale (1 = *strongly disagree* to 4 = *strongly agree*) how much each statement applies to them.

Authenticity Scale (AS)

The Authenticity Scale (AS; Wood et al., 2008; adapted to Serbian by Grijak, 2017) consists of 12 items that assess three separate components of authenticity: Authentic living (4 items, e.g., "I believe it's better to be yourself than to be popular."), Self-alienation (4 items, e.g., "I don't know how I really feel."), and Acceptance of external influence (4 items, e.g., "Other people's opinions strongly influence me."). Respondents are asked to rate the extent to which each statement describes them on a seven-point Likert scale (1 = *does not describe me at all* to 7 = *describes me very well*).

Aggression Questionnaire (BODH)

The Aggression Questionnaire (BODH: Dinić et al., 2014) is intended to assess the level of aggressiveness in respondents on a five-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*). It consists of 23 items that are arranged in four subscales: Anger (5 items, e.g., "I get angry easily."), Vengefulness (6 items, e.g., "I would get revenge on anyone who wronged me."), Dominance (7 items, e.g., "People avoid conflict with me because they know they'll get the worst of it."), and Hostility (5 items, e.g., "I'm often dissatisfied with other people's behavior.").

Data processing

First, participants (n = 32) who did not adequately answer the attention check question were excluded from the sample. After that, the existence of multivariate outliers was considered by calculating Mahalanobis distances, and one more participant was excluded from further data processing. The data were processed using SPSS 24.00. To answer the research hypotheses, we conducted a series of multiple regression analyses

and tested the moderator models using the PROCESS SPSS macro 3.4 (Hayes, 2022).

Results

Descriptive data and correlations

The results indicate that only the measures on the Vengefulness scale deviate from the normal distribution, given that the indicators of distribution asymmetry, skewness and kurtosis, are above the limits of +/- 1.5, which some authors take as a threshold (Tabachnick & Fidell, 2013; according to Dinić, 2019). The values of the internal consistency coefficients show that most scales have satisfactory measurement reliability, except for the Flight scale (Table 1).

Table 1

Descriptive Statistics of the Study Variables

Measured variable	*Min*	*Max*	*M*	*SD*	*Sk*	*Ku*	α
BIS	1.00	4.00	2.46	.66	-.18	-.58	.79
BAS	1.00	4.00	2.60	.58	-.08	-.08	.73
Fight	1.00	4.00	2.18	.59	.30	-.15	.74
Flight	1.00	4.00	2.80	.55	-.51	.38	.55
Freeze	1.00	4.00	2.13	.72	.34	-.54	.80
Authentic living	2.25	7.00	5.97	.86	-1.06	1.20	.77
Self-alienation	1.00	7.00	2.99	1.63	.61	-.62	.86
Acceptance of external influence	1.00	7.00	3.22	1.49	.51	-.60	.85
Anger	1.00	5.00	2.32	.93	.46	-.55	.86
Vengefulness	1.00	5.00	1.63	.72	1.61	2.95	.86
Dominance	1.00	4.71	2.13	.72	.63	.14	.77
Hostility	1.00	5.00	3.17	.84	-.01	-.50	.71

Expected associations were obtained between individual personality traits and aspects of authenticity, as well as between different dimensions of authenticity and aggressiveness (Table 2). No high correlations were found between personality traits and aspects of authenticity, indicating that there is no multicollinearity.

Table 2

Pearson Correlation Coefficients Between Personality Traits, Authenticity, and Aggressiveness

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Authentic living	-	-.45**	-.50**	-.36**	.36**	.12*	-.13**	-.29**	-.11*	-.03	.03	-.02
2. Self-alienation		-	.59**	.53**	-.21**	.05	.26**	.32**	.27**	.13**	.07	.21**
3. Acceptance of external influence			-	.59**	-.29**	-.10*	.35**	.44**	.24**	.05	.04	.17**
4. BIS				-	-44**	-.05	.47**	.57**	.32**	.05	.05	.23**
5. BAS					-	.32**	-.25**	-35**	-.03	.02	.18**	-.05
6. Fight						-	-.04	-.18**	.42**	.47**	.59**	.40**
7. Flight							-	.49**	.17**	.01	-.01	.22**
8. Freeze								-	.22**	.02	-.05	.17**
9. Anger									-	.33**	.40**	.58**
10. Vengefulness										-	.50**	.45**
11. Dominance											-	.44**
12. Hostility	-	-	-	-	-	-	-	-	-	-	-	-

Note. $p^{***} < .001$, $^{**}p < .01$, $^{*}p < .05$.

Prediction of authenticity based on personality traits

Three hierarchical regression analyses were conducted to examine the independent contribution of personality traits in predicting aspects of authenticity (authentic living, self-alienation, and acceptance of external influence). Due to their potential contribution to authenticity, we statistically controlled for gender and age in the initial step. While gender differences in authenticity are often inconsistent in the literature (e.g., Erickson & Ritter, 2001; Harter et al., 1998; Lopez & Rice, 2006; Wood et al., 2008), age typically shows a more consistent pattern, with findings suggesting increased authenticity, particularly lower self-alienation and less acceptance of external influence, as individuals age (e.g., Seto & Schlegel, 2018).

The results show that all three models achieve significant prediction. Gender, age, and personality traits contribute the most to the prediction of acceptance of external influence (37%), then to self-alienation (32%), and,

finally, to authentic living (21%). The BIS stands out as a predictor with the largest independent contribution to all three aspects of authenticity, explaining the most variance in self-alienation (positive direction), then in the acceptance of external influence (positive direction), and, finally, in authentic living (negative direction). The BAS stands out as a significant predictor (positive direction) only in predicting authentic living, and is followed by gender (positive direction), Flight (positive direction), and Freeze (negative direction). Regarding self-alienation, the significant individual predictors, in addition to the BIS, are gender and age (negative), as well as Fight (positive). Freeze also significantly predicts the acceptance of external influence (positive direction), as does age (negative direction) (Table 3).

Table 3

Partial Contributions of Gender, Age and Personality Traits to the Prediction of Authenticity

		Authentic living	Self-alienation	Acceptance of external influence
		β	β	β
Model 1	Gender	.03	-.02	.05
	Age	.11*	-.24***	-.18***
		R = .12; R^2 = .01; *Adjusted* R^2 = .01	R = .24; R^2 = .06; *Adjusted* R^2 = .05	R = .19; R^2 = .03; Adjusted R^2 = .03
		$F_{(2, 456)}$ = 3.09; p = .046	$F_{(2, 456)}$ = 14.34; p < .001	$F_{(2, 456)}$ = 8.38; p < .001
		β	β	β
Model 2	Gender	.09*	-.10**	-.06
	Age	.08	-.15***	-.08*
	BIS	-.20***	.47***	.46***
	BAS	.24***	-.01	-.02
	Fight	.01	.09*	-.04
	Flight	.10*	-.00	.07
	Freeze	-.16**	.08	.13**

R = .45; R^2 = .21;	R = .57; R^2 = .32;	R = .61; R^2 = .37;
Adjusted R^2 = .19;	*Adjusted* R^2 = .31;	*Adjusted* R^2 = .36;
ΔR^2 = .19	ΔR^2 = .26	ΔR^2 = .34
$F_{(7, 451)}$ = 16.75; p < .001;	$F_{(7, 451)}$ = 30.44; p < .001;	$F_{(7, 451)}$ = 38.58; p < .001;
$\Delta F_{(5,451)}$ = 21.94, p < .001	$\Delta F_{(5,451)}$ = 34.75, p < .001	$\Delta F_{(5,451)}$ = 48.90, p < .001

Note. *** p < .001. ** p < .01. * p < .05.

Prediction of aggressiveness dimensions based on authenticity

Four hierarchical regression analyses were conducted to examine the independent contribution of aspects of authenticity (authentic living, self-alienation, and acceptance of external influence) in predicting dimensions of aggressiveness (anger, vengefulness, dominance, and hostility). Gender and age were also statistically controlled. This was done to account for their established contribution to certain aspects of aggression, as evidenced by the previous findings showing that gender significantly predicts anger and vengefulness (e.g., Cota-McKinley et al., 2001; Fahlgren et al., 2022; Uzun, 2018), while age significantly predicts predicting anger and hostility. While the predictive effect of gender persisted even after including authenticity, the effect of age diminished, suggesting authenticity might mediate its relationship with aggressiveness (Thomas, 2002).

According to our results (Table 4), three models proved to be statistically significant: the model for predicting anger, vengefulness, and hostility. The percentage of explained variance was not large in any of the models; however, gender, age, and authenticity accounted for the 11% of variance in anger (11%), 6% of the variance in hostility, and 4% of the variance in vengefulness. Self-alienation stood out as the most significant predictor in all three models. Self-alienation had the greatest independent (positive) contribution to the prediction of anger, followed by hostility and vengefulness. Acceptance of external influence significantly and positively predicted anger, while authentic living significantly (positively) predicted hostility, and gender significantly predicted anger (positively) and vengefulness (negatively).

Table 4

Partial Contributions of Gender, Age, and Aspects of Authenticity to the Prediction of Aggressiveness

		Anger	Vengefulness	Dominance	Hostility
Model 1		β	β	β	β
	Gender	.16***	-.15**	-.02	.03
	Age	-.11*	-.01	-.02	-.11*
		R = .19; R^2 = .04; *Adjusted* R^2 = .03	R = .16; R^2 = .02; *Adjusted* R^2 = .02	R = .03; R^2 = .00; *Adjusted* R^2 = -.00	R = .12; R^2 = .01; *Adjusted* R^2 = .01
		$F_{(2, 456)}$ = 8.51; p < .001	$F_{(2, 456)}$ = 5.69; p = .004	$F_{(2, 456)}$ = .24; p = .783	$F_{(2, 456)}$ = 3.10; p = .046
Model 2		β	β	β	β
	Gender	.16***	-.15**	-.02	.02
	Age	-.04	.01	-01	-.06
	Authentic living	.04	.05	.09	.13*
	Self-alienation	.21***	.16**	.09	.19**
	Acceptance of external influence	.13*	-.02	.04	.11
		R = .33; R^2 = .11; *Adjusted* R^2 = .10; ΔR^2 = .07	R = .20; R^2 = .04; *Adjusted* R^2 = .03; ΔR^2 = .02	R = .11; R^2 = .01; *Adjusted* R^2 = .00; ΔR^2 = .01	R = .25; R^2 = .06; *Adjusted* R^2 = .05; ΔR^2 = .05
		$F_{(5,453)}$ = 11.30; p < .001; $\Delta F_{(3,453)}$ = 12.73, p < .001	$F_{(5, 453)}$ = 3.99; p = .001; $\Delta F_{(3,453)}$ = 2.82, p = .039	$F_{(5, 453)}$ = 1.07; p = .377; $\Delta F_{(3,453)}$ = 1.62, p = .185	$F_{(5, 453)}$ = 6.16; p < .001; $\Delta F_{(3,453)}$ = 8.10, p < .001

Note. *** p < .001. ** p < .01. * p < .05

Interaction effects of different aspects of authenticity on the relationship between personality traits and aggressiveness

We used Model 1 and centered the variables involved in the interaction. The results of the significant moderation models are presented in Table S1 in the Supplemental Materials.

First, a moderation analysis was conducted with Anger as the criterion variable. We found significant interaction effects of Freeze and authentic living ($\Delta R^2 = .01$, $F_{(1,455)} = 4.49$, $p = .035$) and Freeze and acceptance of external influence ($\Delta R^2 = .01$, $F_{(1,455)} = 3.86$, $p = .05$) on the Anger dimension.

According to our results, the association between the tendency to fight and the experience of anger was most pronounced in individuals with lower levels of self-alienation and acceptance of external influences. An increase in either self-alienation or acceptance of external influences weakened this connection. However, given that these interactions primarily show a change in effect size rather than in the direction of the conditional effect, and given that their statistical significance is most likely a result of our study's large sample size, we do not interpret these interactions as substantial (for the graphical representations of these findings, see Figure S1 and Figure S2 in the Supplemental Materials.

The connection between the tendency to freeze and the experience of anger was initially not significant when considering participants with the most pronounced authentic living. However, our results showed that this connection is most pronounced in participants with a higher level of authentic living, and the size of this effect increases with increasing levels of authentic living. The connection between Freeze and the tendency towards anger is most pronounced in participants who are less prone to accepting external influences. The size of the effect decreases with increasing expression of external influence, indicating that accepting external influences weakens this connection ultimately leading to loss of significance when considering participants who are the most prone to accepting external influences (Table S1 in the Supplemental Materials and Figure 1 and 2).

Figure 1

Authentic Living as a Moderator Between Freeze and Anger

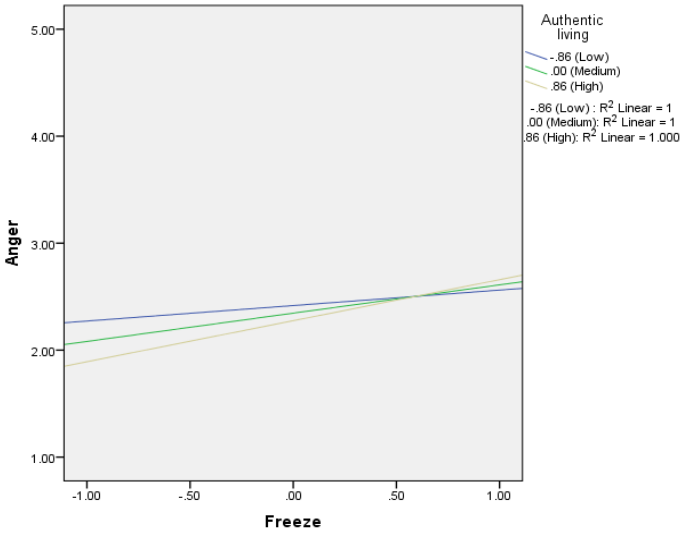
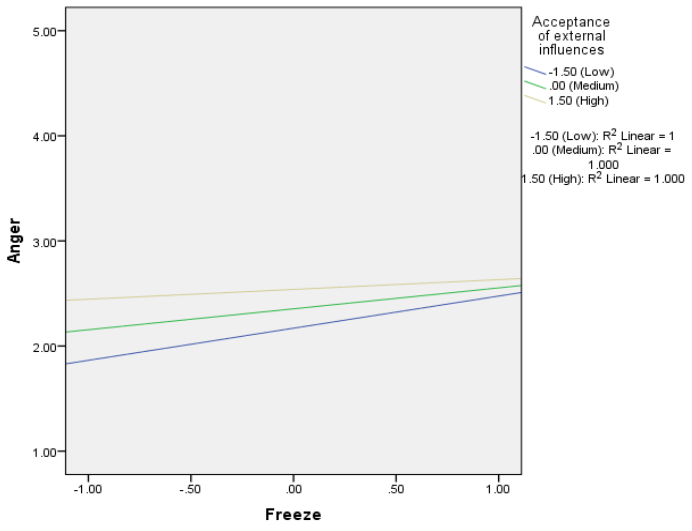


Figure 2

Acceptance of External Influence as a Moderator Between Freeze and Anger



In the analysis of the moderation model where Dominance is the criterion variable, significant interaction effects of BAS and authentic living (ΔR^2 = .01, $F_{(1,455)}$ = 5.83, p = .016) and BAS and self-alienation (ΔR^2 = .01, $F_{(1,455)}$ = 5.01, p = .026) were found on the Dominance dimension.

There were significant interaction effects of BAS and authentic living on the Dominance dimension. The interaction effect of BAS and self-alienation on Dominance was also significant. According to our findings, the connection between BAS and dominance was the strongest in individuals who exhibited the lowest level of authentic living, the connection between BAS and dominance is strongest. This connection weakened at the middle level of expressed authentic living and lost significance in participants with the most pronounced authentic living. In contrast, at the highest level of self-alienation, the connection between BAS and dominance was most pronounced. This connection weakened at the average level of expressed self-alienation, and, in participants with the least expressed alienation from themselves, it lost significance (Table S4 in the Supplemental Materials and Figures 3, 4).

Figure 3

Authentic Living as a Moderator Between BAS and Dominance

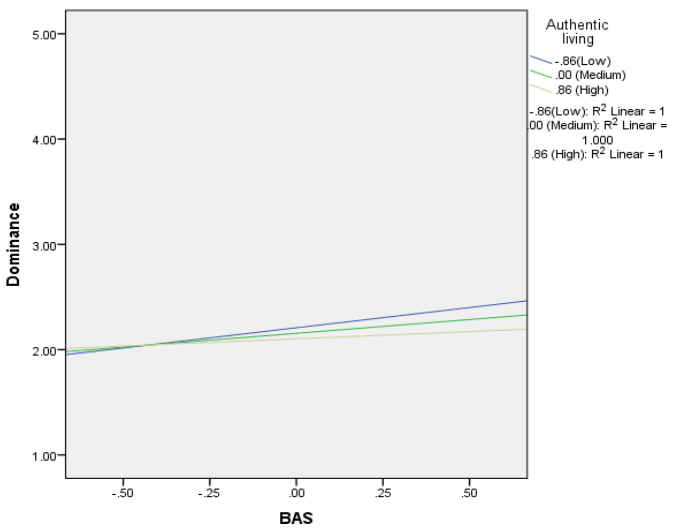
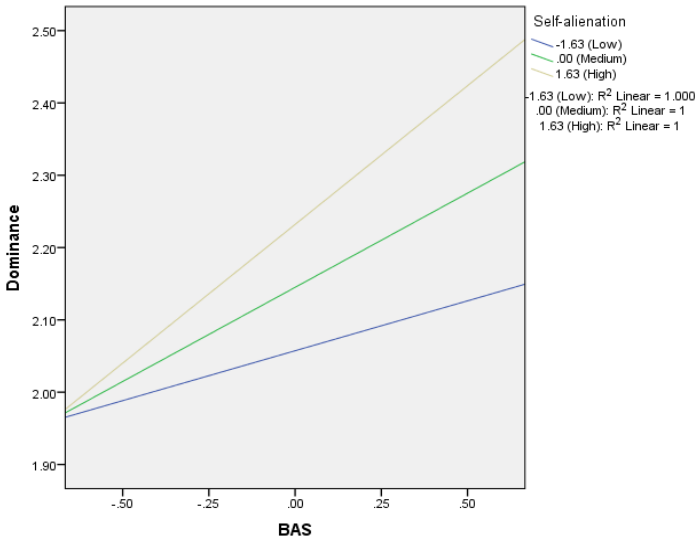


Figure 4

Acceptance of External Influence as a Moderator Between BAS and Dominance

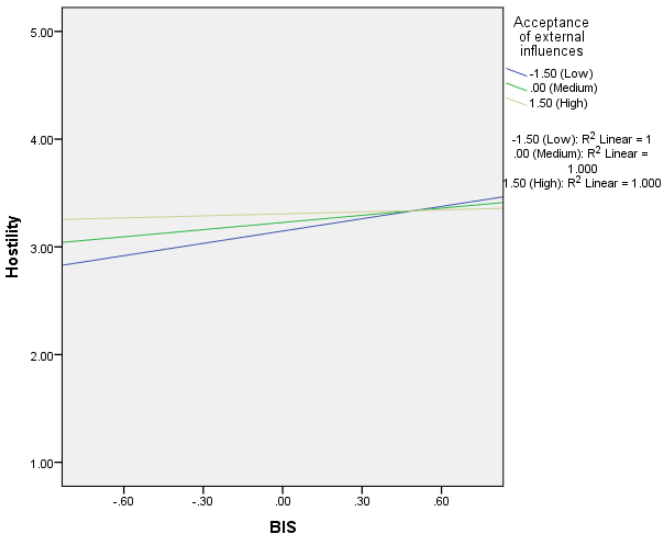


Finally, a significant interaction between BIS and acceptance of external influence was found ($\Delta R^2 = .01$, $F_{(1,455)} = 7.18$, $p = .008$), indicating the relationship between the BIS and Hostility dimensions was moderated by the acceptance of external influence dimension.

The connection between BIS and hostility was the strongest in individuals who were least prone to accepting external influences. This connection weakened at the next level of expressed external influences, and became insignificant in participants with the most pronounced acceptance of external influences (Table S5 in the Supplemental Materials and Figure 5).

Figure 5

Acceptance of External Influence as a Moderator Between BIS and Hostility



Discussion

This research aimed to examine the prediction of authenticity by rRST personality traits and to explore the predictive and moderating role of authenticity in relation to aggressiveness. Our findings provide significant insights into these complex interrelationships. A central finding of this research is that authenticity dimensions significantly moderated the relationships between rRST traits (BIS, BAS, and FFFS) in predicting various dimensions of aggressiveness, which highlights the role of the authentic self in shaping behavioral output from defensive and appetitive systems.

The moderation analysis revealed that authenticity dimensions significantly shaped the relationship between the defensive systems (BIS and FFFS) and anger/hostility. The association between Freeze and anger was strongest in individuals with the highest authentic living, weakening and becoming non-significant as authentic living decreased. This suggests that for those who live in accordance with their values (Rogers, 1961; Wood et al., 2008), the impediment shaped by freezing in expressing their essential being

results in more intense anger. Furthermore, the association between Freeze and anger was most pronounced in individuals less prone to accepting external influences, diminishing as acceptance of external influences increased. Such a finding implies that individuals accustomed to compliance may experience freezing less as a thwarting of personal autonomy, leading to a less intense anger reaction. Similarly, less susceptibility to external influences (an indicator of higher authenticity) led to a stronger connection between BIS and hostility. Although BIS inhibits overt aggression (Smits & Kuppens, 2005), hostility (i.e., passive aggression and low tolerance; Dinić et al., 2014) can serve as a "safer" outlet for aggressive feelings when direct confrontation is inhibited. The obtained results suggests that authenticity, through enhanced emotional regulation (Kernis & Goldman, 2006; Rogers, 1961), influences the expression of aggressive feelings, rather than necessarily diminishing them. These nuanced findings underscore authenticity's complex role in emotional self-regulation and internal experience integration (Kernis & Goldman, 2006; Wood et al., 2008); rather than solely attenuating negative emotions, authenticity can amplify anger when an individual's authentic expression is impeded by the Freeze response or channel aggressive feelings into passive hostility. This offers novel insights into the subtle interaction between defensive systems and the authentic self in emotional reactions to threat.

In contrast, the moderation analysis concerning the Behavioral Activation System (BAS) revealed unexpected patterns, showing that authenticity determines how appetitive motivation is channeled toward dominance. The strongest connection between BAS and dominance was observed in individuals with low authentic living and high self-alienation. This indicates that a lack of authenticity (a mismatch between self-awareness and behavior; Rogers, 1961) can "unleash" BAS-driven proactive aggression, where dominance (the need for control and imposing opinions; Dinić et al., 2014) becomes a compensatory mechanism. While BAS generally promotes active and exploratory behavior, without the guiding role of an authentic self towards prosocial goals (Rogers, 1961; Wood et al., 2008), its energy can be redirected towards maladaptive forms of expression, especially when impulsivity and impulse control difficulties associated with BAS are present (Smederevac et al., 2014).

Additionally, this study revealed that rRST personality traits significantly predict individual differences in authenticity, underscoring rRST's more potent and conceptually refined predictive framework compared to previous findings (Pinto et al., 2011). Specifically, the combination of low BIS and high BAS emerged as optimal for the experience of authenticity, a key finding that underscores the critical interplay between threat avoidance and reward seeking for overall optimal psychological functioning (e.g., Grégoire et al., 2014; Grijak, 2017, 2018; Naumova & Naumov, 2022; Rivera et al., 2019; Thomaes et al., 2017; Wood et al., 2008). In terms of individual systems, BIS consistently predicted lower authentic living and higher self-alienation and acceptance of external influences. This finding aligns with previous research (Pinto et al., 2011; Wood et al., 2008), suggesting that heightened worry leads individuals to suppress genuine self-expression and seek safety in conformity, consistent with the rRST's conceptualization of BIS as a system for threat assessment and conflict resolution (Gray, & McNaughton, 2000; Smederevac et al., 2014). Conversely, BAS positively predicted authentic living, suggesting that individuals sensitive to rewarding stimuli (Gray & McNaughton, 2000) are more likely to actively explore their environments and inner experiences, fostering personal growth and an authentic self. This is indirectly supported by positive associations between authenticity and approach-related traits (Grégoire et al., 2014; Wood et al., 2008). Within FFFS, the Freeze response predicted acceptance of external influences and negatively predicted authentic living, reflecting how the perceived paralysis (Smederevac et al., 2014) hinders genuine self-expression and inherently fosters passive compliance (Gray & McNaughton, 2000). The Flight response was marginally associated with authentic living and the Fight response with self-alienation; nevertheless, considering their marginal statistical significance and the unsatisfactory reliability of the Flight scale, we refrain from drawing further interpretations from these specific results.

Our results demonstrate that different aspects of authenticity significantly predict certain dimensions of aggressiveness, underscoring the complex role of authenticity in shaping aggressive behavior. Consistent with previous findings (Pinto et al., 2012), self-alienation emerged as the strongest predictor of aggressiveness, particularly anger and hostility. Additionally, acceptance of external influences was significantly associated with a greater

degree of anger and hostility, suggesting that individuals prone to conformity may also be more prone towards aggressive behavior. A notable, unexpected finding was the positive association between authentic living and hostility. This appears contrary to humanistic principles (Rogers, 1961) that link authenticity with psychological maturity and reduced aggression (e.g. McCormick et al., 2015; Pinto et al., 2012), suggesting a more complex relationship where authentic individuals, living in accordance with their values, might experience intense anger when their essential being is thwarted. This finding suggests that authenticity may not eliminate negative emotions but rather shape their expression, consistent with authenticity's role in emotional self-regulation and internal experience integration (e.g., Kernis & Goldman, 2006; Wood et al., 2008).

Limitations

This research has several limitations. A primary limitation involves the correlational nature of our design. While our moderation models support the hypothesized associations, results should not be interpreted as proof of causality. Alternative causal pathways or the contribution of unmeasured variables, such as social adaptation, cannot be ruled out. Second, the study relied on only one personality model (rRST), which may limit the comprehensiveness of the findings. Future research could utilize other theoretical personality frameworks (e.g., HEXACO) to obtain a more complete picture of the relationships between personality traits from different paradigms and the tripartite conception of authenticity. Third, the findings should be interpreted with caution due to the non-representative nature of the sample, which was predominantly female and composed mainly of students. This limits the generalizability of our results to the wider population. Fourth, the Flight scale demonstrated unsatisfactory measurement reliability in our sample. While its findings were included for theoretical completeness and exploratory purposes, these specific results should be interpreted with caution until further validation of the scale's reliability in similar contexts. Finally, a limitation of this study lies in the lack of deeper exploration into the role of socio-demographic variables, such as gender and age, on the relationships between the examined constructs. Although these were treated as control variables in this research, previous

studies have emphasized the importance of differences in authenticity and aggressiveness with respect to gender and age. Therefore, to better understand their role in the relationships between the studied constructs, future research should assign gender and age a different status within the model, moving beyond their exclusive treatment as control variables.

Conclusion

This research provides significant insights into the complex associations among rRST personality traits, authenticity, and aggressiveness, highlighting rRST's contribution to explaining the variance in authenticity, particularly acceptance of external influences. A key finding is that optimal authenticity is characterized by a combination of low BIS and high BAS, indirectly suggesting a configuration that contributes to overall psychological functioning. Furthermore, the study demonstrated that authenticity not only predicts various dimensions of aggressiveness but also moderates the association between rRST traits and aggressiveness. It was shown how authentic living and acceptance of external influences shape the association of anger with Freeze, and how authenticity modifies the relationship of BAS with dominance and BIS with hostility. These findings enrich the theoretical understanding of interactions among reinforcement sensitivity systems and the authentic self. Furthermore, they offer practical implications for promoting authenticity and reducing aggressiveness through strategies aimed at balancing behavioral systems and fostering authentic self-expression.

Funding

This study was partially supported by the Ministry of Science, Technological Development and Innovations of the Republic of Serbia (Contract No. 451-03-34/2026-03/200165) and by the project “The study and teaching of psychology, social policy, social work and the labor market in celebration of the 55th anniversary of the Faculty of Philosophy, University of Niš“, conducted at the University of Niš – Faculty of Philosophy (No. 373/1-12-01).

Conflict of interest

We have no conflicts of interest to disclose.

Data availability statement

Data files are available upon a reasonable request.

References

Akin, A., & Akin, U. (2014). Examining the relationship between authenticity and self-handicapping. *Psychological Reports, 115*(3), 795–804. https://doi.org/10.2466/09.PR0.115c26z1

Allen, J. J., & Anderson, C. (2017). Aggression and violence: Definitions and distinctions. In P. Sturmey (Ed.), *The Wiley handbook of violence and aggression*. John Wiley & Sons.

Barrett-Lennard, G. T. (1998). *Carl Rogers' helping system: Journey and substance*. Sage.

Carver, C.S. (2004). Negative affects deriving from the Behavioral Approach System. *Emotion, 4*(1), 3–22. https://doi.org/10.1037/1528-3542.4.1.3

Chester, D. S., & DeWall, C. N. (2013). Trait aggression. In M. S. Eastin (Ed.), *Encyclopedia of media violence* (pp. 352–356). Sage.

Cooper, A., Gomez, R., & Buck, E. (2008). The relationships between the BIS and BAS, anger and responses to anger. *Personality and Individual Differences, 44*(2), 403–413. https://doi.org/10.1016/j.paid.2007.09.005

Corr, P. J., & Perkins, A. M. (2009). Differentiating defensive and predatory aggression: Neuropsychological systems and personality in sex differences. *Behavioral and Brain Sciences, 32*(3-4), 274–275. https://doi.org/10.1017/S0140525X09990434

Cota-McKinley, A. L., Woody, W. D., & Bell, P. A. (2001). Vengeance: Effects of gender, age, and religious background. Aggressive Behavior: *Official Journal of the International Society for Research on Aggression, 27*(5), 343–350. https://doi.org/10.1002/ab.1019

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Plenum Press.

Depue, R. A., & Collins, P. F. (1999). Neurobiology of the structure of personality: Dopamine, facilitation of incentive motivation, and extraversion. *Behavioral and Brain Sciences, 22*(03), 491–517. https://doi.org/10.1017/s0140525x99002046

Dinić, B. (2019). *Principi psihološkog testiranja [Principles of psychological testing]*. Novi Sad, RS: Filozofski fakultet. Preuzeto sa http://digitalna.ff.uns.ac.rs/sadrzaj/2019/978-86-6065-540-2

Dinić, B., Mitrović, D., i Smederevac, S. (2014). Upitnik BODH (Bes, Osvetoljubivost, Dominacija, Hostilnost): Novi Upitnik za procenu agresivnosti *[The AVDH questionnaire (Anger, Vengefulness, Dominance and Hostility): New questionnaire for measurement of aggressiveness]*. *Primenjena Psihologija, 7*, 297–324. https://doi.org/10.19090/pp.2014.3-1.297-324

Erickson, R. J., & Ritter, C. (2001). Emotional labor, burnout, and inauthenticity: Does gender matter? *Social Psychology Quarterly, 64*, 146–163. https://doi.org/10.2307/3090130

Fahlgren, M. K., Cheung, J. C., Ciesinski, N. K., McCloskey, M. S., & Coccaro, E. F. (2022). Gender differences in the relationship between anger and aggressive behavior. *Journal of Interpersonal Violence*, *37*(13-14), NP12661–NP12670. https://doi.org/10.1177/0886260521991870

Gray, J. A. (1987). *The psychology of fear and stress (2nd ed.)*. Cambridge University Press.

Gray, J. A., & McNaughton, N. (2000). *The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system* (2nd ed.). Oxford University Press.

Grégoire, S., Baron, L., Ménard, J., & Lachance, L. (2014). The Authenticity Scale: Psychometric properties of a French translation and exploration of its relationships with personality and well-being. *Canadian Journal of Behavioural Science / Revue Canadienne Des Sciences Du Comportement, 46*(3), 346–355. https://doi.org/10.1037/a0030962

Grijak, D. (2017). Authenticity as a predictor of mental health *[Authenticity as a predictor of mental health]*. *Klinička Psihologija, 10*(1–2), 23–34. https://doi.org/10.21465/2017-KP-1-2-0002

Grijak, D. (2018). Validacija srpske adaptacije Skale autentičnosti u partnerskim odnosima - (AIRS) *[Validation of the Serbian adaptation of the Authenticity in Close Relationships Scale – AIRS]*. *Primenjena Psihologija, 11*(1), 89–104. https://doi.org/:10.19090/pp.2018.1.89-104

Harmon-Jones, E. (2003). Anger and the behavioral approach system. *Personality and Individual Differences, 35*(5), 995–1005. https://doi.org/10.1016/S0191-8869(02)00313-6

Harmon-Jones, E., & Sigelman, J. (2001). State anger and prefrontal brain activity: evidence that insult-related relative left-prefrontal activation is associated with experienced anger and aggression. *Journal of Personality and Social Psychology, 80*(5), 797–803. https://doi.org/10.1037/0022-3514.80.5.797

Harter, S. (2002). Authenticity. In C. R. Snyder & S. J. Lopez (Eds.), *Handbook of positive psychology* (pp. 382–394). Oxford University Press.

Harter, S., Waters, P. L., Whitesell, N. R., & Kastelic, D. (1998). Level of voice among female and male high school students: Relational context, support, and gender orientation. *Developmental Psychology, 34*, 892–901. https://psycnet.apa.org/doi/10.1037/0012-1649.34.5.892

Hayes, A. (2022). *Introduction to mediation, moderation, and conditional process analysis: a regression-based approach*. Guilford Publications.

Hicks, J. A., Schlegel, R. J., & Newman, G. E. (2019). Introduction to the Special Issue: Authenticity: novel insights into a valued, yet elusive, concept. *Review of General Psychology, 23*(1), 3–7. https://doi.org/10.1177/1089268019829474

Horney, K. (1951). *Neurosis and human growth*. Routledge.

Joseph, S., & Linley, P. A. (2005). Positive adjustment to threatening events: An organismic valuing theory of growth through adversity. *Review of General Psychology, 9*, 262–280. https://doi.org/10.1037/1089-2680.9.3.262

Kernis, M. H., & Goldman, B. M. (2006). A multicomponent conceptualization of authenticity: Theory and research. *Advances in Experimental Social Psychology, 38*, 283–357. https://doi.org/10.1016/S0065-2601(06)38006-9

Krupić, D., & Dinić, B. (2017). Situational cues trigger Risk assessment, Fight, Flight, but not Freeze in Blanchard's threat scenarios". *Human Ethology Bulletin, 32*(2) 14–23. https://doi.org/10.22330/heb/322/014-023

Krupić, D., Križanić, V., & Corr, P. J. (2016). Personality and defensive behaviour: A factor analytic approach to threat scenario choices. *Personality and Individual Differences, 94*, 303–308. https://doi.org/10.1016/j.paid.2016.01.045.

Lopez, F. G., & Rice, K. G. (2006). Preliminary development and validation of a measure of relationship authenticity. *Journal of Counseling Psychology, 53*(3), 362-371. https://psycnet.apa.org/doi/10.1037/0022-0167.53.3.362

Maltby, J., Wood, A. M., Day, L., & Pinto, D. (2012). The position of authenticity within extant models of personality. *Personality and Individual Differences, 52*, 269–273. https://doi.org/10.1016/j.paid.2011.10.014

Maslow, A. H. (1968). *Toward a Psychology of Being*. John Wiley & Sons.

McCormick, W. H., Turner, L. A., and Foster, J. D. (2015). A model of perceived parenting, authenticity, contingent self-worth and internalized aggression among college students. *Personality and Individual Differencess, 86*, 504–508. https://doi.org/10.1016/j.paid.2015.06.050

Međedović, J. (2013). Analiza interakcija prediktora u modelima linearne regresije: primer stranačke evaluacije [Analysis of the interaction of predictors in the linear regression models: An example of party evaluation]. *Primenjena Psihologija*, *6*(3), 267–286. https://doi.org/10.19090/pp.2013.3.267-286

Naumova, K. & Naumov, F. (2022). The relevance of authenticity to clinical distress: Reaffirming the role of self-alienation. *Primenjena Psihologija, 15*(1), 3–27. https://doi.org/10.19090/pp.v15i1.2361

Pinto, D. G., Maltby, J. & Wood, A.M. (2011). Exploring the tripartite model of authenticity within Gray's approach and inhibition systems and Cloninger's bio-social model of personality. *Personality and Individual Differences, 51*, 194–197. https://doi.org/10.1016/j.paid.2011.03.040

Pinto, D. G., Maltby, J., Wood, A. M., & Day, L. (2012). A behavioral test of Horney's linkage between authenticity and aggression: People living authentically are less-likely to respond aggressively in unfair situations. *Personality and Individual Differences, 52*(1), 41–44. https://doi.org/10.1016/j.paid.2011.08.023

Randđelović, K. (2016). Efekti socijalne pretnje i tipa povratne informacije na kognitivne pristrasnosti i socijalnu anksioznost [The effects of social threat and type of feedback on cognitive biases and social anxiety]. Doctoral dissertation, University of Novi Sad. https://nardus.mpn.gov.rs/handle/123456789/6583

Randđelović, K., Smederevac, S., Čolović, P., & Corr, P. J. (2018). Fear and anxiety in social setting: An experimental study. *Journal of Individual Differences, 39*, 61–75. https://doi.org/10.1027/1614-0001/a000251

Rivera, G. N., Christy, A. G., Kim, J., Vess, M., Hicks, J. A., & Schlegel, R. J. (2019). Understanding the relationship between perceived authenticity and well-being. *Review of General Psychology, 23*, 113–126. https://doi.org/10.1037/gpr0000161

Rogers, C. R. (1961). *On becoming a person: A therapist's view of psychotherapy*. Constable.

Sedikides, C., Slabu, L., Lenton, A., & Thomaes, S. (2017). State authenticity. *Current Directions in Psychological Science, 26*(6), 521–525. https://doi.org/10.1177/0963721417713296

Seto, E., & Schlegel, R. J. (2018). Becoming your true self: Perceptions of authenticity across the lifespan. *Self and Identity, 17*(3), 310–326. https://doi.org/10.1080/15298868.2017.1322530

Sheldon, K. M. (2004). Integrity (honesty/authenticity). In C. Peterson & M. E. P. Seligman (Eds.), *Character strengths and virtues* (pp. 249–272). Oxford University Press.

Smederevac, S., Čolović, P. i Mitrović, D. (2009). Procena osetljivosti na potkrepljenje *[Assessment of sensitivity to reinforcement]*. U Biro, M., Smederevac, S. i Novović, Z. (ured.), *Procena psiholoških i pishopatoloških fenomena* (str. 89–100). Beograd: Centar za primenjenu psihologiju.

Smederevac, S., Mitrović, D., Čolović, P., & Nikolašević, Ž. (2014). Validation of the measure of revised reinforcement sensitivity. *Journal of Individual Differences, 35*(1), 12–21. https://doi.org/10.1027/1614-0001/a000121

Smillie, L. D., Pickering, A. D., & Jackson, C. J. (2006). The new reinforcement sensitivity theory: Implications for personality measurement. *Personality and Social Psychology Review, 10*, 320–335. https://doi.org/10.1207/s15327957pspr1004_3.

Smits, D. J., & Kuppens, P. (2005). The relations between anger, coping with anger, and aggression, and the BIS/BAS system. *Personality and Individual differences, 39*(4), 783–793. https://doi.org/10.1016/j.paid.2005.02.023

Thomaes, S., Sedikides, C., van den Bos, N., Hutteman, R., & Reijntjes, A. (2017). Happy to be ''me?" Authenticity, psychological need satisfaction, and subjective well-being in adolescence. *Child Development, 88*, 1045–1056. https://doi.org/10.1111/cdev.12867

Thomas, S. P. (2002). Age differences in anger frequency, intensity, and expression. *Journal of the American Psychiatric Nurses Association, 8*(2), 44–50. https://doi.org/10.1067/mpn.2002.124412

Uzun, G. Ö. (2018). Vengeance scale: reliability and validity study with gender differences. *Quality and Quantity, 52*(Suppl 2), 1455–1469. https://doi.org/10.1007/s11135-018-0726-5

Winnicott, D. W. (1965). *The maturational processes and the facilitating environment*. International Universities Press.

Wood, A. M., Linley, P. A., Maltby, J., Baliousis, M., & Joseph, S. (2008). The authentic personality: A theoretical and empirical conceptualization and the development of the Authenticity Scale. *Journal of Counseling Psychology, 55*(3), 385–399. https://doi.org/10.1037/0022-0167.55.3.385

Wu, A. D., & Zumbo, B. D. (2008). Understanding and using mediators and moderators. *Social Indicators Research*, *87*, 367–392. https://doi.org/10.1007/s11205-007-9143-1

Yalom, I. D. (1980). *Existential psychotherapy*. Basic Books.

Primenjena psihologija
Vol. 19, No. 1, pp. 87–110, 2026

Research Article

Personality Traits and Disgust Sensitivity in Shaping Consumer Intentions toward Insect-Based Foods in Croatia

Krešimir Jakšić[1], Raquel Guiné[2], and Marijana Matek Sarić[3]

[1] *Department of Psychology, University of Zadar, Zadar, Croatia*
[2] *Polytechnic Institute of Viseu, Campus Politécnico, Viseu, Portugal*
[3] *Department of Health Studies, University of Zadar, Zadar, Croatia*

ABSTRACT

Insects represent a nutritious and environmentally friendly alternative to meat. However, cultural acceptance is a significant challenge in promoting insect consumption; in Western societies, insects are often associated with negative experiences rooted in cultural and religious beliefs, traditions, myths, and personal experiences. To better understand the barriers to insect consumption in the Croatian national context, we conducted a paper-and-pencil study, using a sample of 609 participants who had never eaten insect-based food to replicate previous findings on the role of disgust sensitivity and personality traits. Our findings showed that, for both males and females, pathogen disgust sensitivity was negatively related to the intention to consume insect-based food; moral disgust (violation of social norms) was not associated with consumer intention. For females, conscientiousness was negatively related to the consumption of insect-based food. For males, consumption intention was positively related to openness and negatively related to extraversion and agreeableness. The study results partially align with previous findings from other cultural contexts and point to the role of psychological mechanisms in explaining insect-based food consumption.

Keywords: disgust sensitivity, personality traits, insect eating, food neophobia, Croatian sample

UDK: 159.923:612.39(497.5)
DOI: 10.19090/pp.v19i1.2630
Received: 03.05.2025.
Revised: 12.09.2025.
Accepted: 09.10.2025.

✉ Corresponding author's email: kjaksic21@unizd.hr

Introduction

In the EU, including Croatia, novel food is defined as food not significantly consumed before May 15, 1997, under the first Novel Food Regulation (Regulation - 258/97, 1997). The current regulation (Regulation - 2015/2283, 2015) mandates that new food products undergo rigorous scientific assessment by the European Food Safety Authority (EFSA) before market approval. Since 2021, the EU has authorized several insect species for consumption, including the yellow mealworm (*Tenebrio molitor*), migratory locust (*Locusta migratoria*), house cricket (*Acheta domesticus*), and Lesser mealworm (*Alphitobius diaperinus*). In January 2025, the European Commission approved the use of UV-treated Tenebrio molitor larvae powder in various food products, with mandatory allergen labelling for individuals allergic to crustaceans and dust mites (Regulation - 2025/89, 2025).

Insects have a high content of micro- and macronutrients, which can be even higher than in animal foods (Imathiu, 2020). They are particularly rich in proteins, lipids, fibre, and minerals (Acosta-Estrada et al., 2021). Compared to beef and pork, for example, insects are particularly rich in unsaturated fatty acids, with some species containing up to 75% of the total fatty acid content (Lange & Nakamura, 2023). Insects are also an environmentally friendly alternative to meat (Onwezen et al., 2019). Their production produces fewer greenhouse gases and requires less land (Aidoo et al., 2023).

Globally, an estimated two billion people consume approximately 1,900 insect species (Omuse et al., 2024). In the European Union (EU), major markets for insect-based food products include Sweden, Belgium, Germany, Italy, Poland, and France (International Platform of Insects for Food and Feed, 2024). In contrast, the Croatian market is relatively small. Previous research on edible insects in Croatia shows a diverse landscape of knowledge, perceptions, and sustainability awareness. International surveys to which Croatia was included (Guiné et al., 2022; Guiné, Duarte, et al., 2023; Guiné, Florença, et al., 2023; Guiné, Florença, Bartkiene, et al., 2024; Guiné, Florença, Costa, et al., 2024) show that knowledge about edible insects is limited, with many consumers expressing disgust or aversion to eating them (Guiné, Florença, Bartkiene, et al., 2024). Consumption is generally low, with

curiosity or food scarcity being potential motivations for experimentation (Guiné et al., 2022). Compared to countries such as Mexico, insect consumption in Croatia is lower, and participants often perceive insects as exotic and culturally taboo, reflecting the general European trend (Guiné, Florença, et al., 2023). Acceptance is influenced by socio-demographic factors such as age, education, and income, while gender and living environment appear to be less influential (Guiné, Florença, Bartkiene, et al., 2024). Croatian consumers are only moderately aware of the high protein content of insects, but are less well informed about possible antinutritional effects and general nutritional benefits compared to populations in countries such as Lithuania (Guiné, Florença, Costa, et al., 2024).

A significant challenge in promoting insect consumption is cultural acceptance (Guiné et al., 2022). In Western societies, insects are often associated with negative experiences rooted in cultural and religious beliefs, traditions, myths, and personal experiences. Investigating these barriers can provide insights into consumer preferences, cultural influences, and potential shifts in dietary choices. It may also aid in developing strategies to overcome reluctance and promote insect-based food products (Orkusz & Orkusz, 2024).

As a first step toward understanding the mechanisms influencing insect consumption, this study aims to replicate and expand previous findings on the role of personality traits (Machado-Oliveira et al., 2020) and disgust sensitivity (Andrić et al., 2023) in insect consumption. By examining these factors, the present study seeks to contribute to a broader understanding of consumer behavior and potential interventions to increase the acceptance of insect-based food.

Personality traits

Personality traits represent stable interindividual differences related to adaptation and interaction (Larsen & Buss, 2008), allowing behavioral predictions across situations and time (Church et al., 2008). The Big Five model (McCrae & Costa, 1987) remains the most prominent model of personality, encompassing Openness (intellectual curiosity, aesthetics), Conscientiousness (competitiveness, self-discipline), Extraversion (sociability,

sensation-seeking), Agreeableness (altruism, tenderness), and Neuroticism (anxiety, impulsivity; Borghans et al., 2008).

Regarding novel food acceptance, Machado-Oliveira et al. (2020) found openness and extraversion negatively related to food neophobia, while openness and agreeableness positively related to approach motivation towards new food. However, research on personality and food neophobia remains scarce, particularly concerning insect consumption.

Muiruri (2024) reported that conscientiousness negatively predicted willingness to eat insect-based food in a Norwegian sample, with the roles of extraversion (positive) and agreeableness (negative) being significant only for females. In a study by Wang and Park (2024), openness was positively related to entomophagy in both genders in Japan, whereas conscientiousness (negative for females) and agreeableness (positive in males) had gender-specific effects. Moreover, according to Russell and Knott (2021), the willingness to eat insects was positively predicted by extraversion and openness and negatively predicted by conscientiousness; neuroticism emerged as an additional negative predictor in their second study.

Disgust sensitivity

Disgust is one of the central human emotions, with women generally scoring higher than men on measures of disgust sensitivity (Tybur et al., 2009). Unlike personality traits, disgust sensitivity has been extensively studied in the context of insect-eating, likely due to its role in pathogen avoidance (Cepon-Robins, 2024). Health concerns have been identified as a barrier to insect consumption among Western children (Jones, 2020) and the general Polish population, with allergic reactions being a specific concern (Szlachciuk & Żakowska-Biemans, 2024). This aligns with findings showing that pathogen disgust sensitivity negatively correlates with insect consumption (Andrić et al., 2023; Modlinska et al., 2021; Peksever et al., 2024; Ruby & Rozin, 2019; Russell & Knott, 2021; Serpico et al., 2021; Sogari et al., 2023).

However, disgust extends beyond the pathogen domain. Tybur et al. (2009) proposed an evolutionary basis for disgust, encompassing sexual and moral dimensions, with moral disgust being linked to avoidance of norm

violators. Social norms play a crucial role in insect consumption: Berger & Wyss (2020) found that beliefs about descriptive norms (e.g., how many others consume insects) influence willingness to eat insects in Western samples. Similarly, Mulazzani et al. (2023) reported that Italians who view eating fish fed with insects as moral exhibit stronger consumption intentions. Russell & Knott (2021) also noted moral concerns as a barrier to insect consumption. Such findings align with the Theory of Planned Behavior (Ajzen, 1991), which highlights subjective norms as key determinants of behavioral intentions.

Present research

Considering the noted nutritional benefits of insect consumption and the lack of research on insects in Croatia, this study had two specific objectives. Firstly, given the lack of research on the relationship between personality traits and insect consumption, we wanted to further explore the relevance of personality traits to insect consumption and verify previous findings in a national sample. Given the cultural diversity and lack of previous research, we had no well-founded a priori hypotheses. However, as the previous results regarding the roles of openness and conscientiousness appeared to be fairly consistent, we expected openness to be positively related and conscientiousness to be negatively related to consumption intention (Russell & Knott, 2021; Muiruri, 2024; Wang & Park, 2024). Second, given the relevance of pathogen disgust and moral norms to insect consumption (Berger & Wyss, 2020; Szlachciuk & Żakowska-Biemans, 2024), we wanted to investigate whether we could confirm previous findings in the national sample. We expected both domains of disgust to be negatively associated with consumer intention (Andrić et al., 2023; Mulazzani et al., 2023).

Method

Participants

The initial sample included 682 participants from the general population of Croatia. Of those, 609 participants who were sure that they had never eaten insects were retained as the final sample. Most participants were females (n = 348), had no bachelor or master studies finished (n = 403),

lived in the urban environment (*n* = 371), had an average national income (*n* = 343), and worked or studied in the areas (*n* = 324) that are not directly relevant for the research domain (e.g. not in nutritionism, agriculture, environmental research, biology, medicine, tourism). The average age of the participants was 37.14 years (*SD* = 15.31).

Instruments

Disgust Sensitivity

To measure disgust sensitivity, we used the Croatian adaptation (Ćubela Adorić et al., 2014) of the Three Domains of Disgust Scale (Tybur et al., 2009). The original scale measures disgust sensitivity in three domains: pathogen, sexual, and moral. For this research, we used items to measure pathogen (7 items, e.g. *Stepping on dog poop*) and moral disgust (7 items, e.g. *Stealing from a neighbour*). Participants rated their agreement with each statement on the Likert-type scale ranging from 0 *(not disgusting at all*) to 6 (*extremely disgusting*). The internal consistency of the Pathogen subscale was α = .76, while that of the Moral subscale was α = .81. Correlation between the two subscales was $r(605) = .16$, $p < .01$.

Personality Traits

Personality was measured using Croatian adaptation (Kardum et al., 2006) of Big Five Inventory (John & Srivastava, 1999) that measures Openness (10 items, *I see myself as someone who is original, comes up with new ideas*), Conscientiousness (9 items, *I see myself as someone who does a through job*), Extraversion (8 items, *I see myself as someone who is talkative*), Agreeableness (9 items, *I see myself as someone who is helpful and unselfish with others*), Neuroticism (8 items*, I see myself as someone who is depressed, blue*). Participants rated their agreement with each statement on a Likert-type scale ranging from 1 (*completely disagree*) to 5 (*completely agree*). Internal consistency of the personality dimensions was Openness: α = .78, Conscientiousness: α = .82, Extraversion: α = .65, Agreeableness: α = .70, Neuroticism: α = .76. Openness, conscientiousness, extraversion, and agreeableness were positively correlated, with the highest correlation being between agreeableness and conscientiousness ($r(606) = .44$, $p < .01$).

Intention of Insect Eating

The intention of the insect-eating was assessed with the following question: "If you have never eaten insects, would you consider consuming them?" Response options were: 1. Surely no, 2. Maybe, 3. Yes, but only in the form of prepared food that includes insects (for example, hamburger or cookies), and 4. Yes, in the form of whole insects and prepared foods.

Procedure

Data collection took place from October 2021 to December 2021 as part of the wider research under the *EISufood: Study about food habits and knowledge about edible insects as sustainable foods* project (Guiné et al., 2022). Trained student assistants distributed the paper-pencil questionnaires to at least 10 participants, respecting both gender (equal distribution) and age of participants. To participate in the survey, participants had to be at least 18 years of age. Participation was voluntary and anonymous. Before completing the questionnaire, respondents were informed by student assistants about the study's aims and purpose. Respondents were given sufficient time to decide whether to participate, and study leaders or student assistants were available to answer any questions. Then, they completed the questionnaire privately. Contact details of the principal investigators (email and phone number) were available in case participants encountered any difficulties or later wished to withdraw from participation.

Participants first reported on their socio-demographic data, including age, gender (male/female/without answer), education (PhD/bachelor or master degree/without bachelor or master degree), living environment (village/suburban/urban), income (significantly below the national average/below the national average/equal to national average/higher than national average/significantly higher than national average), and field of work (nutrition /agriculture/ environmental research /biology/ medicine/ tourism/ other). After the socio-demographics, participants completed other measures listed in the Instruments.

The study was approved by the Ethics Committee of the University of Zadar (approval number: KLASA: 114-06/21-01/19; URBROJ: 15-21-01; approval date: October 5, 2021) and was conducted according to the principles of the Declaration of Helsinki.

Formal analyses

For the purposes of the main analyses, we summed the frequencies of the answers to the question of intention of insect eating and created two categories: *Surley No* (*n* = 421) and *Would consider* (*n* = 182); the latter was created by merging the three response options: *Maybe* (*n* = 138), *Yes, but only in the form of prepared food that includes insects (for example, hamburger or cookies)* (*n* = 19), and *Yes, in the form of whole insects and prepared foods* (*n* = 25). The reason for dividing participants into those categories is assumption that participants who would surely eat insects in some form and those who may eat them are more similar to each other than the group of participants who are sure they would not eat insect-based foods.

All the correlational analyses were calculated separately for both genders, controlling for the age (in male sample) and living environment (in female sample). The reason for doing so is that gender has emerged as a confounding variable when it comes to the relationship between personality and insect eating (Muiruri, 2024; Wang & Park, 2024), and there are gender differences in disgust sensitivity (Tybur et al., 2009). Furtherome, in this research age in men sample ($\rho(255) = -.17$, $p < .01$) and living environment in female sample ($\rho(340) = -.15$, $p < .01$; females from more urban areas are less willing to consume insect based food) were negatively correlated with the willingness to eat insect-based products. Due to the unbalanced distribution of intention to consume insects, for both genders, Spearman coefficient was used to quantify the relationship between this variable and disgust sensitivity and personality traits.

All analyses were carried out using the average values of the participants for the selected continuous variables in the JASP software (v. 0.19.3, JASP Team, 2024) with *p* value set to 0.05. Missing cases were excluded pairwise.

Results

First, we present descriptive statistics for disgust sensitivity and personality traits for both women and men. Participants' scores on both personality and disgust sensitivity dimensions were moderate, with women's results, in absolute terms, being somewhat higher (Table 1).

Table 1

Descriptive Data on Disgust Sensitivity and Personality Traits for Females and Males

	Females					Males				
	M	*SD*	*Min*	*Max*	*n*	*M*	*SD*	*Min*	*Max*	*n*
Pathogen disgust	3.64	1.20	0	6	347	3.28	1.25	0	6	259
Moral disgust	4.39	1.19	0	6	348	4.12	1.22	0	6	260
Openness	3.57	.62	1	5	347	3.40	.62	1	5	260
Conscientiousness	3.81	.65	1	5	348	3.61	.69	1	5	259
Extraversion	3.56	.61	1	5	348	3.52	.56	1	5	260
Agreeableness	3.81	.56	1	5	348	3.65	.58	1	5	260
Neuroticism	2.69	.74	1	5	348	2.56	.67	1	5	260

Note. *n* – number of participants.

Furthermore, additional analyses revealed that all skewness and kurtosis indices for females fell within the ±1.4 range, whereas for males, they were within the ±0.7 range, indicating no strong departure from the normal distribution. In addition, pathogen disgust was negatively correlated with openness in females ($r(344) = -.11$, $p < .05$), whereas moral disgust was significantly correlated with openness ($r(345) = .15$, $p < .01$), extraversion ($r(346) = .15$, $p < .01$), conscientiousness ($r(346) = .18$, $p < .01$), and neuroticism ($r(346) = -.15$, $p < .01$). In males, pathogen disgust was correlated with conscientiousness ($r(256) = -.21$, $p < .01$), while moral disgust was associated with conscientiousness ($r(257) = .19$, $p < .01$), agreeableness ($r(258) = .30$, $p < .01$) and neuroticism ($r(258) = -.24$, $p < .01$).

Within each gender, approximately 70% of participants reported being sure about not intending to consume insect food; approximately 30% of participants reported they would consider consuming it (Table 2).

Table 2

Frequency of Willingness to Consume Insect Food for Females and Males

	Females	Males
Surley No	245 (71.01%)	175 (68.09 %)
Would consider	100 (28.99%)	82 (31.91%)

Furthermore, we explored the relationship (partial Spearman correlation) between disgust sensitivity and willingness to consume insects in both genders, controlling for age (male sample) and living environment (female sample). According to our results (Table 3), pathogen disgust was negatively related to the intention of insect food consumption in both females ($\rho(339) = -.16$, $p < .01$) and males ($\rho(254) = -.18$, $p < .01$). Moral disgust was not related to the eating intention in any gender ($\rho_{females}(340) = -.11$, $p > .05$; $\rho_{males}(255) = -.02$, $p > .05$). Moreover, more conscientious females were less likely to consume insect-based food. In the subsample of males, participants who were more open were more likely to consume insect-based food, while participants who were more extraverted and agreeable were less likely to do so.

Table 3

Partial Spearman Correlations (ρ) Between Personality Traits and Intention of Insect Food Consumption for Females and Males

Personality trait	Females	*df*	Males	*df*
Openness	.09	339	.15*	255
Conscientiousness	-.11*	340	-.12	254
Extraversion	-.09	340	-.14*	255
Agreeableness	-.02	340	-.18*	255
Neuroticism	.02	340	.09	255

Note. * $p < 0.05$.

Discussion

The aim of the present study was to explore the relationship between personality traits and disgust sensitivity with the intention to consume insect-based food in a Croatian sample from the general population. Our results partially align with some of the previous findings in the field, further emphasizing the importance of assessing the role of gender in these relationships.

Personality traits and intention to consume insect-based food

In line with the results of previous studies (Muiruri, 2024; Wang & Park, 2024), our findings suggest gender is an important factor to consider in entomophagy research. Namely, while both approach and inhibitory effects was observed in males, only the inhibitory effect was present in females.

The inhibitory effect of conscientiousness in females is in accordance with the findings of Wang & Park (2024), and it may be explained by concerns related to health and nutrition (Jones, 2020; Szlachciuk & Żakowska-Biemans, 2024). Specifically, conscientiousness is generally linked to careful decision-making, a preference for structured behaviour, and a strong adherence to personal or socially accepted health norms. This may be especially true in a traditionally male-dominated culture, which may lead females to prioritize health-related behaviours over personal preferences, impacting their dietary choices (Polić & Holy, 2021; Żurawska et al., 2025). Additional confirmation for the relationship between conscientiousness and acceptance of social norms in females comes from its positive relation with moral disgust. Individuals who score high in conscientiousness often demonstrate a heightened awareness of dietary risks and benefits, making them more selective in their food choices. Given that conscientiousness is positively associated with healthy eating habits (Tsartsapakis & Zafeiroudi, 2024), it is possible that health-conscious females avoid consuming insect-based foods due to concerns about their safety, nutritional adequacy, or potential contaminants.

Despite their high protein content and recognized nutritional benefits, concerns regarding the presence of pollutants, allergens, or microbial contamination in insect-based products may deter health-conscious consumers. For instance, depending on the environment in which they are cultivated, insects may accumulate heavy metals, pesticides, or other harmful substances, raising questions about food safety (Labu et al., 2022; Li et al., 2023; Schrögel & Wätjen, 2019; van der Fels-Klerx et al., 2018). If conscientious individuals prioritize food purity and minimal exposure to contaminants, they may be particularly hesitant to consume insects unless they are assured of strict quality control measures. This suggests that the willingness of conscientious females to adopt insect-based diets could, at least to some extent, be influenced by targeted education and transparent

information about food safety standards. If consumers receive well-structured and scientifically backed data on the regulation, processing, and nutritional benefits of insect-based products, they may be more likely to reconsider their initial reluctance.

In males, extraversion and agreeableness had an inhibitory effect, while openness was related to approach motivation. Such findings may be explained by the characteristics of these traits – since extraverted individuals are seeking positive emotionality (Borghans et al. 2008), they may avoid stimuli that can induce negative emotions due to unfamiliarity. Besides, agreeable individuals make decisions based on automated processing that favours the simplicity of thinking (Madjaroski 2018). Since food based on insects is novel and familiarization with it requires more effort, more agreeable males may not be ready to invest resources into finding the facts about insect-based food. This implies that it would be important to present critical facts about insect-based food in a straightforward and easy-to-access manner to promote its consumption among highly agreeable males. Presumably, this strategy would be more effective if social values favoured insect consumption, as agreeableness in the male sample appears to be positively related to social norms (moral disgust). Approach motivation related to openness is in accordance with the previous research (Russell & Knot, 2021; Wang & Park, 2024) and may be explained by the notion that people high on openness are curious (Borghans et al., 2008) and therefore willing to try new food (Tsartsapakis & Zafeiroudi, 2024). Therefore, focusing on the novel experience of insect-based food, according to these results, may promote its consumption among males with high openness.

As mentioned, the effect of personality traits in females may be inhibited due to cultural context and social norms (Buczek & Tomaszek, 2022; Otterbring & Festila, 2022; Roberts et al., 2009; Tsartsapakis & Zafeiroudi, 2024). Females are more responsive to social norms regarding food choices than males, probably due to reputation and guilt concerns (Dannenberg et al., 2024). This may explain the non-significant effects of extraversion, agreeableness, and openness in the female sample, as well as the non-significant effect of conscientiousness in the male sample.

Furthermore, it is important to note that the lack of association between neuroticism (impulsiveness) and insect eating (also seen in the

previous studies; e.g., Muiruri, 2024; Study 1 in Russell & Knot, 2021; Wang & Park, 2024) suggests that consuming insect-based foods is not driven by spontaneous decision-making in any gender. However, given different cultural contexts, statistical approaches, and methodological differences among conducted studies, further research is needed before making a strong conclusion about these relations.

Disgust sensitivity and intention to consume insect-based food

When it comes to the relationship between pathogen disgust sensitivity and participants' intention to consume insect-based food, results of the previous studies (Andrić et al., 2023; Modlinska et al., 2021; Peksever et al., 2024; Ruby & Rozin, 2019; Russell & Knott, 2021; Serpico et al., 2021; Sogari et al., 2023) were confirmed for both genders. Participants who reported more disgust were less likely to consume insect-based food. Given that pathogen disgust has evolved with the goal of disease prevention (Tybur et al., 2009) and that health concerns are one of the barriers to insect eating (Jones, 2020; Szlachciuk & Żakowska-Biemans, 2024), these findings were to be expected. Since a strong physiological reaction is a core characteristic of disgust (Alladin et al., 2024), interventions aimed at increasing consumer acceptance of insect-based foods should focus on minimizing these automatic aversive responses. One effective strategy is to modify the presentation of insect-based products to make them more visually and conceptually appealing. This could include using attractive packaging, processing insects into powders or pastes to eliminate visible features that remind consumers of whole insects, and clearly communicating that these products are cultivated under strict hygiene standards (de Boer and Lemke, 2024). Such measures could help reduce the initial disgust response and increase consumer openness to trying insect-based foods. However, while modifying the presentation of insect-based foods may help reduce aversion, it must be done in compliance with food regulations. According to EU No 1169/2011 (European Union, 2011), food labelling and marketing must not mislead or deceive consumers. This means that while businesses can enhance the visual appeal of insect-based foods and provide reassuring information about their safety, they cannot obscure or misrepresent the product's true nature. If insect-derived ingredients are hidden in a way that prevents consumers from making informed choices, this would contradict

the ethical and legal standards established for food marketing and labelling. A balanced approach, therefore, would involve emphasizing the benefits of insect-based foods—such as their high protein content, environmental sustainability, and safety—while ensuring that consumers are fully informed about what they are purchasing. Educating the public on the rigorous production and quality control measures in place for edible insects could also help build trust and acceptance. Additionally, future research should explore whether repeated exposure, sensory adaptation, or culinary innovations (e.g., integrating insect-based ingredients into familiar food products) can further reduce the initial disgust reaction and promote wider acceptance of insect consumption.

Contrary to some previous research findings (Berger and Wyss, 2020; Mulazzani et al., 2023; Russell and Knott, 2021), adherence to social norms, operationalized as moral disgust, was not correlated with the intention to eat insect-based products in our study. One possible reason for the non-significant finding may be associated with how we measured disgust toward violation of social norms (i.e., we measured disgust toward violation of social norms in a general sense [e.g., stealing], but not in the context of food consumption). Besides, it is important to note that moral disgust is conceptually hard to define, given that participants may use the word disgust in the moral domain for similar emotions with negative valence (e.g., repulsion) (masked for review). However, given the novelty of this research question in both domestic and a broader international context, further research is needed before drawing any more definitive conclusions.

Limitations

One of the limitations of the present study is statistical in the sense that responses on the intention to consume insect-based food were unbalanced, meaning that approximately 30% of the participants, for both genders, declared their willingness to consume insects. To overcome this issue, we used a non-parametric approach (Spearman Rho). However, by doing so, we lost some statistical power. For the same reason, we did not conduct regression analysis to explore which personality trait is the most predictive of the consumer intention in males. Such an analysis would require the use of robust estimators (e.g., Bayesian estimation or robust maximum

likelihood) and was beyond the scope of this article. Relatedly, it would be interesting to compare the predictive power of disgust sensitivity and personality traits, which, for the reason mentioned, was not done. According to the bandwidth-fidelity dilemma (Cronbach & Gleser, 1957), specific predictors should predict specific outcomes better than general ones. In this regard, given that disgust sensitivity, especially pathogen one, is closely related to the gustatory system, it may have more predictive power than personality traits. However, to the best of our knowledge, this has yet to be examined. Moreover, personality trait extraversion had somewhat lower internal reliability due to the sample characteristics. Also, the sample is not representative of the population (e.g., women are overrepresented, participants are on average younger than the national average age), so the results cannot be generalized. Finally, to measure participants' intention to consume insect-based food, we relied on self-reports. To complement these findings and improve external validity, behavioural measures should be used.

Conclusion

Food neophobia, the tendency to avoid unfamiliar foods, is a key factor influencing the acceptability of insect-based foods (Ros-Baró et al., 2022). Individuals with neophobic tendencies are expected to be more hesitant to consume insect-based foods (Faccio & Guiotto Nai Fovino, 2019; Hopkins et al., 2023; Sogari et al., 2019). As the demand for sustainable food alternatives grows, understanding the psychological barriers and motivators associated with insect consumption will become increasingly important. To the best of our knowledge, this is the first study in Croatia that explored the relationship between personality traits, disgust sensitivity, and consumers' intention to eat insect-based food. Results are partly in accordance with the previous international findings; however, future studies are needed before making any stronger conclusions about the relationships of interest.

Given the increasing relevance of insect-based foods in the modern food industry—both as a sustainable protein source and as an environmentally friendly alternative to traditional livestock—continued research in this field is essential. Future studies should explore these relationships in greater depth, incorporating diverse methodologies such as longitudinal research designs, experimental interventions, and cross-cultural

comparisons to determine the stability and generalizability of these findings. Additionally, examining the impact of targeted educational campaigns, sensory exposure, and marketing strategies on consumer willingness to adopt insect-based diets could offer practical insights for policymakers, food producers, and sustainability advocates.

Acknowledgement

The authors thank to student assistants for the help with data collection.

Funding

This work is funded by National Funds through the FCT—Foundation for Science and Technology, I.P., within the scope of the projects Ref. UIDB/00681 (CERNAS), research unit, and it was prepared in the ambit of the project EISuFood of the CERNAS-IPV and the Polytechnic University of Viseu.

Conflict of interest

We have no conflicts of interest to disclose.

Data availability statement

Data are available at https://github.com/kjaksic/Eisu-food.

References

Acosta-Estrada, B. A., Reyes, A., Rosell, C. M., Rodrigo, D., & Ibarra-Herrera, C. C. (2021). *Benefits and challenges in the incorporation of insects in food products*. *Frontiers in Nutrition, 8*, 687712. https://doi.org/10.3389/fnut.2021.687712

Aidoo, O. F., Osei-Owusu, J., Asante, K., Dofuor, A. K., Boateng, B. O., Debrah, S. K., Ninsin, K. D., Siddiqui, S. A., & Chia, S. Y. (2023). Insects as food and medicine: a sustainable solution for global health and environmental challenges. *Frontiers in Nutrition*, *10*, Article 1113219. https://doi.org/10.3389/fnut.2023.1113219

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*, 179-211. https://doi.org/10.1016/0749-5978(91)90020-T

Alladin, S. N. B., Judson, R., Whittaker, P., Attwood, A. S., & Dalmaijer, E. S. (2024). Review of the gastric physiology of disgust: Proto-nausea as an under-

explored facet of the gut-brain axis. *Brain and Neuroscience Advances*, *8*, 23982128241305890. https://doi.org/10.1177/23982128241305890

Andrić, A., Miličić, M., Bojanić, M., Obradović, V., Šašić Zorić, L., Petrović, M., & Gadjanski, I. (2023). Survey on public acceptance of insects as novel food in a non-EU country: A case study of Serbia. *Journal of Insects as Food and Feed*, *10*, 91–106. https://doi.org/10.1163/23524588-20230024

Berger, S., & Wyss, A. M. (2020). Consumers' willingness to consume insect-based protein depends on descriptive social norms. *Frontiers in Sustainable Food Systems*, *4*, 144. https://doi.org/10.3389/fsufs.2020.00144

Borghans, L., Duckworth, A. L., Heckman, J. J., & Weel, B. (2008). The economics and psychology of personality traits. *Journal of Human Resources*, *43*, 972–1059. https://doi.org/10.3368/jhr.43.4.972

Buczek, P., & Tomaszek, K. (2022). Mediacyjna rola zachowań zdrowotnych w relacji między cechami osobowości i dobrostanem psychicznym [The mediational role of health behaviors in the relationship between personality traits and mental well-being]. *Psychologia Rozwojowa*, *26*(4), Article 4. https://doi.org/10.4467/20843879pr.21.026.15482

Cepon-Robins, T. J. (2024). Disgust: An emotion for pathogen avoidance. In L. Al-Shawaf & T. K. Shackelford (Eds.), *The Oxford handbook of evolution and the emotions* (p. 181-202). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780197544754.013.11

Church, A. T., Katigbak, M. S., Reyes, J. A., Salanga, M. G., Miramontes, L. A., & Adams, N. B. (2008). Prediction and cross-situational consistency of daily behavior across cultures: Testing trait and cultural psychology perspectives. *Journal of Research in Personality*, *42*, 1199–1215. https://doi.org/10.1016/j.jrp.2008.03.007

Cronbach, L. J., & Gleser, C. G. (1957). *Psychological tests and personnel decisions*. University of Illinois Press. https://doi.org/10.1086/402166

Ćubela Adorić, V., Tybur, J.M., & Jakšić, K. (2014, May). *Psychometric properties of the Croatian version of the Three Domains Disgust Scale: A preliminary report*. Poster presented at 19th Psychology Days, Zadar, Croatia. https://www.croris.hr/crosbi/publikacija/prilog-skup/620523

Dannenberg, A., Klatt, C., & Weingärtner, E. (2024). The effects of social norms and observability on food choice. *Food Policy*, *125*, Article 102621. https://doi.org/10.1016/j.foodpol.2024.102621

de Boer, B., & Lemke, M. (2024) Insect consumption and aesthetic disgust: Using design fiction to imagine novel food experiences. *International Journal of Food Design* 9(2), 245–265. https://doi.org/10.1386/ijfd_00065_1

European Union. (2011). *Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers*. Official Journal of the European Union, L 304, 18–63. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32011R1169

Faccio, E., & Guiotto Nai Fovino, L. (2019). Food neophobia or distrust of novelties? Exploring consumers' attitudes toward GMOs, insects and cultured meat. *Applied Sciences*, *9*(20), Article 20. https://doi.org/10.3390/app9204440

Guiné, R. P. F., Florença, S. G., Anjos, O., Boustani, N. M., Chuck-Hernández, C., Matek Saric, M., Ferreira, M., Costa, C., Bartkiene, E., Cardoso, A. P., Tarcea, M., Correia, P. M. R., Campos, S., Papageorgiou, M., Abarquero Camino, D., Korzeniowska, M., Černelič-Bizjak, M., Kruma, Z., Damarli, E., Ferreira, V., & Djekic, I. (2022). Are consumers aware of sustainability aspects related to edible insects? Results from a study involving 14 countries. *Sustainability*, *14*, 14125. https://doi.org/10.3390/su142114125

Guiné, R. P. F., Florença, S. G., Costa, C. A., Correia, P. M. R., Ferreira, M., Cardoso, A. P., Campos, S., Anjos, O., Chuck-Hernández, C., Matek Saric, M., et al. (2023). Investigation of the level of knowledge in different countries about edible insects: Cluster segmentation. *Sustainability*, *15*(1), 1–19. https://doi.org/10.3390/su15010450

Guiné, R. P. F., Duarte, J., Chuck-Hernández, C., Boustani, N. M., Djekic, I., Bartkiene, E., Matek Saric, M., Papageorgiou, M., Korzeniowska, M., Combarros-Fuertes, P., et al. (2023). Validation of the scale knowledge and perceptions about edible insects through structural equation modelling. *Sustainability*, 15(4), 1–25. https://doi.org/10.3390/su15042992

Guiné, R. P. F., Florença, S. G., Bartkiene, E., Tarcea, M., Chuck-Hernández, C., Djekic, I., … Anjos, O. (2024). Edible insects – Exotic food or gastronomic innovation? Study involving 14 countries. *Journal of Culinary Science & Technology*, *23*(4), 857–876. https://doi.org/10.1080/15428052.2024.2354216

Guiné, R. P. F., Florença, S. G., Costa, C. A., Correia, P. M. R., Ferreira, M., Cardoso, A. P., Campos, S., Anjos, O., Bartkiene, E., & Saric, M. M. (2024).

Information about nutritional aspects of edible insects: Perspectives across different European geographies. *AIMS Agriculture and Food*, *9*(3), 921–933. https://doi.org/10.3934/agrfood.2024050

Hopkins, I., Farahnaky, A., Gill, H., Danaher, J., & Newman, L. P. (2023). Food neophobia and its association with dietary choices and willingness to eat insects. *Frontiers in Nutrition*, *10*, 1150789. https://doi.org/10.3389/fnut.2023.1150789

Imathiu, S. (2020). Benefits and food safety concerns asso-ciated with consumption of edible insects. *NFS Journal*, *18*, 1-11. https://doi.org/10.1016/j.nfs.2019.11.002

International Platform of Insects for Food and Feed (2024*). EU consumer acceptance survey: 2024 European edible insects report*. https://ipiff.org/wp-content/uploads/2024/03/Report_Survey_Results_12Mar2024.pdf

JASP Team (2024). JASP (Version 0.19.3)[Computer software].

John, O.P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In L.A. Pervin & O.P. John (Eds.), *Handbook of personality: Theory and research* (pp. 102–138). Guilford Press. https://psycnet.apa.org/record/1999-04371-000

Jones, V. (2020). 'Just don't tell them what's in it': Ethics, edible insects and sustainable food choice in schools. *British Educational Research Journal*, *46*, 894–908. https://doi.org/10.1002/berj.3655

Kardum, I., Gračanin, A., & Hudek-Knežević, J. (2006). Odnos crta ličnosti i stilova privrženosti s različitim aspektima seksualnosti kod žena i muškaraca [The relationship between personality traits and attachment styles with different aspects of sexuality in women and men]. *Psychological Topics*, *15*, 101–128.

Labu, S., Subramanian, S., Cheseto, X., Akite, P., Kasangaki, P., Chemurot, M., Tanga, C. M., Salifu, D., & Egonyu, J. P. (2022). Agrochemical contaminants in six species of edible insects from Uganda and Kenya. *Current Research in Insect Science*, *2*, 100049. https://doi.org/10.1016/j.cris.2022.100049

Lange, K. W., & Nakamura, Y. (2023). *Potential contribution of edible insects to sustainable consumption and production. Frontiers in Sustainability, 4*, Article 1112950. https://doi.org/10.3389/frsus.2023.1112950

Larsen, R. J., & Buss, D. M. (2008). *Personality psychology: Domains of knowledge about human nature* (3rd edition). McGraw Hill. http://catdir.loc.gov/catdir/enhancements/fy0665/2006047327-t.html

Li, M., Mao, C., Li, X., Jiang, L., Zhang, W., Li, M., Liu, H., Fang, Y., Liu, S., Yang, G., et al. (2023). Edible insects: A new sustainable nutritional resource worth promoting. *Foods*, *12*(22), 4073. https://doi.org/10.3390/foods12224073

Machado-Oliveira, M. C., Nezlek, J. B., Rodrigues, H., & Sant'Ana, A. S. (2020). Personality traits and food consumption: An overview of recent research. *Current Opinion in Food Science*, *33*, 91–97. https://doi.org/10.1016/j.cofs.2020.02.005

Madjaroski, G. (2018). *The Influence of Big Five Personality Traits on Dual-Process Cognitive Information Processing Styles in Medical Decision-Making* [Master thesis, Lund University]. https://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=8950015&fileOI d=8933

McCrae, R. R., & Costa, P. T. (1987). Validation of the five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology*, *52*, 81–90. https://doi.org/10.1037/0022-3514.52.1.81

Modlinska, K., Adamczyk, D., Maison, D., Goncikowska, K., & Pisula, W. (2021). Relationship between acceptance of insects as an alternative to meat and willingness to consume insect-based food-A study on a representative sample of the Polish population. *Foods*, *10*, 2420. https://doi.org/10.3390/foods10102420

Muiruri, S. W. (2024). Norwegian consumers' willingness to try food made from insects: The role of trust, food choice motives and OCEAN personality traits. *Journal of Agriculture and Food Research*, *18*, 101381. https://doi.org/10.1016/j.jafr.2024.101381

Mulazzani, L., Arru, B., Camanzi, L., Furesi, R., Malorgio, G., Pulina, P., & Madau, F. A. (2023). Factors influencing consumption intention of insect-fed fish among italian respondents. *Foods*, *12*, Article 17. https://doi.org/10.3390/foods12173301

Omuse, E. R., Tonnang, H. E. Z., Yusuf, A. A., Machekano, H., Egonyu, J. P., Kimathi, E., Mohamed, S. F., Kassie, M., Subramanian, S., Onditi, J., Mwangi, S., Ekesi, S., & Niassy, S. (2024). The global atlas of edible insects: Analysis of diversity and commonality contributing to food systems and sustainability. *Scientific Reports*, *14*, 5045. https://doi.org/10.1038/s41598-024-55603-7

Onwezen, M. C., van den Puttelaar, J., Verain, M. C. D., & Veldkamp, T. (2019). Consumer acceptance of insects as food and feed: The relevance of

affective factors. *Food Quality and Preference*, *77*, 51–63. https://doi.org/10.1016/j.foodqual.2019.04.011

Orkusz, A., & Orkusz, M. (2024). Edible insects in Slavic culture: Between tradition and disgust. *Insects*, *15*(5), Article 5. https://doi.org/10.3390/insects15050306

Otterbring, T., & Festila, A. (2022). Pandemic prevention and personality psychology: Gender differences in preventive health behaviors during COVID-19 and the roles of agreeableness and conscientiousness. *Journal of Safety Science and Resilience*, *3*(1), 87–91. https://doi.org/10.1016/j.jnlssr.2021.11.003

Peksever, D., Ruby, M.B., & El, S.N. (2024). A cross-sectional study of the willingness to consume insects in a culture without entomophagy. *Journal of Insects as Food and Feed*, *10*, 1081-1096. https://doi.org/10.1163/23524588-20230065

Polić, M., & Holy, M. (2021). Gender-biased office culture in Croatian PR industry: why feminine sectors practice masculine patterns? *Corporate Communications*: *An International Journal*, *26*(4), 716-727. https://doi.org/10.1108/CCIJ-04-2021-0042

Regulation—258/97—EN - EUR-Lex. (1997). Retrieved April 1, 2025, from https://eur-lex.europa.eu/eli/reg/1997/258/oj/eng

Regulation—2015/2283—EN - EUR-Lex. (2015). Retrieved April 1, 2025, from https://eur-lex.europa.eu/eli/reg/2015/2283/oj/eng

Regulation—2025/89—EN - EUR-Lex. (2025). Retrieved April 1, 2025, from https://eur-lex.europa.eu/eli/reg_impl/2025/89/oj/eng

Roberts, B. W., Jackson, J. J., Fayard, J. V., Edmonds, G., & Meints, J. (2009). Conscientiousness. In M. R. Leary & R. H. Hoyle (Eds.), *Handbook of individual differences in social behavior* (pp. 369–381). The Guilford Press.

Ros-Baró, M., Sánchez-Socarrás, V., Santos-Pagès, M., Bach-Faig, A., & Aguilar-Martínez, A. (2022). Consumers' acceptability and perception of edible insects as an emerging protein source. *International Journal of Environmental Research and Public Health*, *19*(23), 15756. https://doi.org/10.3390/ijerph192315756

Ruby, M. B., & Rozin, P. (2019). Disgust, sushi consumption, and other predictors of acceptance of insects as food by Americans and Indians. *Food Quality and Preference*, *74*, 155–162. https://doi.org/10.1016/j.foodqual.2019.01.013

Russell, P. S., & Knott, G. (2021). Encouraging sustainable insect-based diets: The role of disgust, social influence, and moral concern in insect consumption. *Food Quality and Preference*, *92*, 104187. https://doi.org/10.1016/j.foodqual.2021.104187

Schrögel, P., & Wätjen, W. (2019). Insects for food and feed—Safety aspects related to mycotoxins and metals. *Foods, 8*(8), 288. https://doi.org/10.3390/foods8080288

Serpico, M., Rovai, D., Wilke, K., Lesniauskas, R., Garza, J., & Lammert, A. (2021). Studying the Emotional Response to Insects Food Products. *Foods*, *10*, 2404. https://doi.org/10.3390/foods10102404

Sogari, G., Menozzi, D., & Mora, C. (2019). The food neophobia scale and young adults' intention to eat insect products. *International Journal of Consumer Studies*, *43*(1), 68–76. https://doi.org/10.1111/ijcs.12485

Sogari, G., Riccioli, F., Moruzzo, R., Menozzi, D., Tzompa Sosa, D. A., Li, J., Liu, A., & Mancini, S. (2023). Engaging in entomophagy: The role of food neophobia and disgust between insect and non-insect eaters. *Food Quality and Preference*, *104*, 104764. https://doi.org/10.1016/j.foodqual.2022.104764

Szlachciuk, J., & Żakowska-Biemans, S. (2024). Breaking the taboo: Understanding the relationship between perception, beliefs, willingness to eat insects, and food neophobia among Polish adults. *Foods*, *13*, Article 6. https://doi.org/10.3390/foods13060944

Tsartsapakis, I., & Zafeiroudi, A. (2024). Personality traits and healthy eating habits and behaviors: A narrative review. *Journal of Educational and Social Research*, *14*, Article 2. https://doi.org/10.36941/jesr-2024-0022

Tybur, J. M., Lieberman, D., & Griskevicius, V. (2009). Microbes, mating, and morality: Individual differences in three functional domains of disgust. *Journal of Personality and Social Psychology*, *97*, 103–122. https://doi.org/10.1037/a0015474

van der Fels-Klerx, H. J., Camenzuli, L., Belluco, S., Meijer, N. P., & Ricci, A. (2018). Food safety issues related to uses of insects for feeds and foods. *Comprehensive Reviews in Food Science and Food Safety*, *17*(5), 1172–1183. https://doi.org/10.1111/1541-4337.12385

Wang, Z., & Park, J. (2024). Does personality make a difference? Exploring the connections between the big five personality traits and entomophagy among Japanese consumers. *Food Quality and Preference*, *119*, 105225. https://doi.org/10.1016/j.foodqual.2024.105225

Żurawska, J., Pięta, B., Wilczak, M., Wojciechowska, M., Rzymski, P., Pieczykolan, A., Krysa, J., & Bień, A. (2025). Personality traits of women with hereditary risk for breast/ovarian cancer versus obstetric history and cancer preventive behaviors. *Scientific Reports*, *15*(1), 3218. https://doi.org/10.1038/s41598-025-87657-6

Primenjena psihologija
Vol. 19, No. 1, pp. 111–140, 2026

Research Article

Knowledge of One's Own Rights, False Beliefs About Quality Relationships, and Dating Violence Victimization: The Mediating Role of Setting Boundaries

Ivana Janković[1]✉, Milica Tošić Radev[1], and Jelisaveta Todorović[1]

[1] *Department of Psychology, Faculty of Philosophy, University of Niš, Serbia*

ABSTRACT

The purpose of the study was to examine the relationship between false beliefs about what makes a quality relationship, knowledge of one's own rights, the ability to set personal boundaries, and adolescent dating violence victimization. The research was conducted on a sample of 895 adolescents who completed a battery of tests, including the Scale of false beliefs about a quality relationship, Knowledge of one's own rights in a relationship scale, Setting boundaries in a relationship scale, and the Victimization in a relationship questionnaire. The results showed gender differences and similarities in the antecedents of dating violence. Personal boundaries acted as a full mediator between false beliefs about the quality of a relationship and all forms of dating victimization in girls and psychological violence in boys. On the other hand, knowing one's own rights significantly predicted victimization only in a male subsample, and this relationship was mediated by the ability to set boundaries. Our results also indicated that boys were more likely than girls to experience all forms of violence. Possible practical implications of the results are discussed.

Keywords: dating violence, adolescence, beliefs, rights, personal boundaries

UDK: 364.632:392.6-057.87
DOI: 10.19090/pp.v19i1.2654
Received: 16.07.2025.
Revised: 06.10.2025.
Accepted: 18.11.2025.

✉ Corresponding author's email: ivana.jankovic@filfak.ni.ac.rs

Introduction

Adolescence is a developmental phase during which individuals establish their first relationships with partners (Hickman et al., 2004), have their first romantic experiences, learn about partnerships (Smetana et al., 2006), and develop their own attitudes and opinions regarding quality relationships or a lack thereof. Given that adolescents encounter a new form of intimate relationships, it is likely that the range of their communication and relationship skills is limited (Fredlanda et al., 2005). For these reasons, adolescence is a particularly vulnerable period when it comes to dating violence (Hickman et al., 2004).

Dating violence is a form of intimate partner violence (IPV), one of the major health and human rights issues faced in the world. Teen dating violence is a term that describes a range of abusive behaviors that preteens, adolescents, and young adults experience in the context of a past or present romantic or dating relationship. The behaviors include physical and sexual violence, stalking, and psychological abuse, which includes control and coercion (Mulford & Blachman-Demner, 2013, p.756). Manifestations of these forms of violence can be numerous: physical violence (e.g., pushing, slapping, hitting, kicking, pulling hair, biting); sexual violence, including all unwanted behaviors of a sexual nature (e.g., unwanted sexual attention, sexual coercion, sexual assault, rape); psychological violence (humiliation, insults, isolation from friends and family, using derogatory names, controlling behavior, verbal and emotional threats; Ajduković & Ručević, 2009; Niolon et al., 2017). Dating violence can occur in both homosexual and heterosexual relationships and may be experienced in person or via technology. In this paper, we focused on exploring dating violence that occurs in heterosexual relationships in person.

Data on the prevalence of dating violence vary across studies. Recent research shows that around 36% of adolescents have experienced violent situations (Dosil et al., 2020), mostly aggressive behavior, such as being punched or held tightly by their partner, being kicked or bitten, stalking etc. (Muñoz-Rivas et al., 2022; Rothman et al., 2020). Furthermore, approximately 1 in 12 adolescents reported experiencing physical dating violence, whereas about 1 in 10 reported experiencing sexual dating violence (Centers for Disease Control and Prevention, 2025). The results of a meta-

analytic study conducted in several European countries (Tomaszewska & Schuster, 2021) showed that the prevalence of victimization varies across different countries and also differs by gender. Several previous studies have confirmed that girls perpetrate more violence in relationships or at least as much as boys (O'Leary et al., 2008; Sears et al., 2007; Wolfe et al., 2001). Additionally, some researchers have suggested that the violence perpetrated by girls is less severe and often occurs in response to experienced violence (Archer, 2000).

The consequences of dating violence are varied and can sometimes be very serious, particularly when the violence takes place during a time when partners are forming their identity (Stith et al., 1992). Some of the consequences of victimization are higher levels of depression, suicidal thoughts, anxiety, somatic mental health symptoms, posttraumatic stress disorder, low self-esteem, poorer educational outcomes, worse general health, reproductive disorders, and poorer pregnancy outcomes (Banyard & Cross, 2008; Campbell, 2002; Kaura & Lohman, 2007; O'Moore & Kirkham, 2001; Papadakaki et al., 2009; Plichta, 2004; Slee & Rigby, 1993). Given these critical links between dating violence and undesirable outcomes for youth and young adults, prevention of this kind of abuse is extremely important.

Over the past thirty years, many theories from different disciplines (sociology, psychology, social work, feminist studies, public health, etc.) have been offered to explain the risk factors of intimate partner violence. Etiological theories of intimate partner violence are numerous and range from genetic theories, which focus on the heritability of aggression, to sociological theories, which emphasize the cultural context and the role of society (e.g., social learning theory, social control theory, feminist theory, resource theory, etc.). Since many personal characteristics have been recognized as important antecedents of victimization, psychological theories have also been used as the conceptual framework of intimate partner violence (e.g., theories of psychopathology, family system theory, attachment theory, etc.). There are also contemporary theories of IPV, such as the neurobiological theory of trauma, theories of intersectionality, and human rights (Figueredo et al., 2012; Kelly, 2011; McLeod et al., 2020), which provide a better framework for understanding the risk factors of IPV and for developing more

effective prevention strategies for dealing with it. Finally, some efforts have been made to propose a more integrative approach to the phenomenon of IPV (e.g., Bell & Naugle, 2008; Johnson, 2006; Winstok, 2007).

One such attempt is Dutton's ecological systems theory (2006). Dutton proposed a nested ecological theory – a framework closely related to the systems theory for understanding intimate partner violence. He identified four levels of systemic social context that bear upon individual behavior. The macrosystem is composed of cultural values and belief systems. It reflects sociocultural influences, such as factors that maintain gender inequality, gender role norms, and pro-violence societal norms (Edleson & Tolman, 1992). The exosystem connects the family and broader environment, covering all the relevant groups and institutions. The microsystem refers to the family as the immediate context that surrounds the individual. It includes factors such as the interaction between intimacy and independence within a dyad (boundaries), the individual's predisposition toward jealousy, and violent responses as a reaction to perceived abandonment (Dutton, 1995). Finally, ontogenetic factors refer to an individual's personal development, and they "define what a particular individual's unique developmental history brings into this three-level social context" (p. 19). Actually, Dutton focuses on the individual as the unit of analysis, but he considers an individual's environment and relationships to be essential for understanding their behavior. The basic premise of his ecological explanations is that each level within the ecosystem interacts with the systems closest to it. Consequently, the social systems (macrosystem and exosystem) have only an indirect influence on a person through the micro-system. The influence of a boarder system is mediated by factors within the intervening ecological systems (Dutton, 1995).

We wanted to follow this line of thinking and explore risk factors of violence during adolescence (knowledge of one's [human] rights, false beliefs about the quality of a relationship, and personal boundaries), all conceptualized as nested within broader social and relational contexts. More precisely, the knowledge of one's (human) rights and beliefs about quality relationships are individual characteristics derived in a broader context – the macrosystem (e.g., the feminist model and social learning theory). Further, personal boundaries are learned in the primary family and through the

relationship with the primary caregiver (microsystem; e.g., the family system theory and attachment theory). Besides focusing on the complex and interrelated networks of risk factors, we aimed to include other factors that are insufficiently researched but are commonly referred to in practice (e.g., personal boundaries) or mentioned in the contemporary theory of violence (e.g., human rights). The inclusion of these underexplored factors could represent an important contribution to existing scientific knowledge on intimate partner violence.

Human rights are rights established in legally enforceable norms that protect both individuals and groups from actions that endanger human dignity and fundamental freedom (Nikolić-Ristanović & Dokmanović, 2006). McLeod et al. (2020) argued that a human rights perspective provides a strong foundation for promoting social justice across diverse areas of professional practice. They emphasized that policy and institutional documents addressing women's rights and autonomy are particularly relevant for developing a holistic understanding of IPV. Such a perspective may also facilitate further advances in research, education, and professional practice. Within this broader human rights framework, it is important to consider how personal rights are experienced within close interpersonal relationships. Tolmacz (2011) highlighted the specific nature of rights and entitlements in close dyadic relationships. Because these relationships are characterized by high levels of intimacy, they generate needs, desires, and expectations that differ from those present in other social relationships. Consequently, the exercise of personal rights in intimate relationships is often intertwined with partners' mutual expectations. At the same time, dating violence and other forms of IPV constitute violations of fundamental human rights. From this perspective, individual differences in the importance attributed to personal rights may influence how individuals perceive, interpret, and respond to potentially harmful partner behaviors. This raises the question of whether the importance individuals attach to exercising personal rights (e.g., the right to diversity or freedom of expression) is related to their experiences of partner violence.

There are often culturally-based misconceptions about the characteristics of a healthy and high-quality relationship. Beliefs that are associated with upholding traditional gender stereotypes, justifying the use

of violence during conflicts, and expecting positive consequences from such conflict resolution are risk factors for relationship violence (O'Keefe, 2005; Riggs & Caulfield, 1997). Some studies confirm the specific relationship between the acceptance of traditional views regarding women's roles in society and gender. Women with such attitudes are more likely to be victims of dating violence, while men are more likely to commit dating violence (Currie, 1983; Sigelman et al., 1984). Hodžić (2007) found that girls who support gender stereotypes in which women are seen as passive, caring, and sensitive are more likely to experience jealous and possessive behavior from their partners. Overall, studies suggest that there is a relationship between justifying teen dating violence and its occurrence (Foshee et al., 2001; Kinsfogel & Grych, 2004; Williams et al., 2008). This correlation between such an attitude and dating violence and victimization is explained by the belief that violent behavior is justified (Kinsfogel & Grych, 2004) and by accepting dating violence as a norm (Foshee et al., 2001). According to Foshee et al. (1999), family violence and its subsequent perpetration in girls and boys were mainly facilitated by an accepting attitude towards dating violence.

Finally, personal boundaries are commonly defined as invisible demarcations that regulate interactions between individuals and their surroundings, providing a sense of security, clarity, and comfort in everyday life (Goldenberg & Goldenberg, 2008; Ben-Ze'ev, 2011). In romantic relationships, boundaries function as mechanisms through which individuals learn to identify, communicate, and negotiate their needs, preferences, and emotions in intimate contexts (Cook, 2015). The ability to set and maintain boundaries with a partner is therefore considered a fundamental skill that adolescents and young adults must acquire to establish supportive relationships free of abuse (Cook, 2015; Piercy, 2024). The importance of boundary-setting is also reflected in violence prevention programs. For example, *Shifting Boundaries* (Taylor et al., 2015) and the *Expect Respect* program (Ball et al., 2012) explicitly address boundaries, while broader interventions such as *Dating Matters™* (Tharp et al., 2011) incorporate boundary-related content as part of relationship skills education. Despite their central role in practice, boundaries are often inconsistently defined and rarely measured directly in empirical research (Niolon et al., 2019; Zarling & Berta, 2017). Recent advances, such as Hutchison's (2024)

operationalization of boundary-setting styles, represent an important step toward systematic measurement, yet the field remains underdeveloped. Earlier studies in the region (e.g., Ajduković et al., 2011a) primarily aimed to map the prevalence and gender differences in adolescent dating violence, as well as to identify school and psychosocial correlates relevant for its prediction. Their approach was situated within a broader framework of adolescent development, focusing on how inaccurate beliefs about relationships and the perceived importance of personal rights contribute to violent dynamics. As part of this analytical framework, readiness to set boundaries was also introduced, examined through gender differences in adolescents' willingness to establish boundaries in relationships. However, boundary-setting was not further examined as a predictor of victimization. At the same time, existing research suggests that individuals with poor boundary-setting skills, often associated with low self-esteem, anxious attachment, or adverse family history, are at greater risk of victimization (Bonache et al., 2017; van Geel et al., 2018; Wekerle et al., 2009; Wolfe et al., 2004). This indicates a theoretical and practical gap between prevention program content and empirical evidence.

This study seeks to address the existing gap by examining boundary-setting as a risk factor that has been highlighted in prevention practice and contemporary theories of violence but remains insufficiently empirically investigated. Drawing on the ecological model of intimate partner violence (Dutton, 2006), we developed a framework in which macrosystem-level factors (knowledge of rights, false beliefs about relationships) and microsystem-level processes (boundary-setting) interact to predict adolescent dating violence victimization. Specifically, we formulated a model to test the following research questions: 1) Can the knowledge of one's rights and false beliefs about the quality of relationships (shaped by the macrosystem) predict adolescent dating violence victimization? And 2) Is the ability to set boundaries (formed in interactions with significant others in the microsystem) a mediator in these relationships? In addition to testing the model, the present study also aims to examine the prevalence of dating violence victimization by gender, given that previous research has produced varying results (O'Leary et al., 2008; Sears et al., 2007; Tomaszewska & Schuster, 2021; Wincentak et al., 2017). Accordingly, the proposed model will also be tested on subsamples of girls and boys.

Method

Sample and procedure

Since there were no empirical data from previous research on the intercorrelations between the examined variables, we were unable to conduct an a priori power analysis to justify the sample size. Instead, we followed the rule of requiring more than 200 participants for more complex statistical analyses, including the structural equation modeling (Kline, 2016). The study included 1,022 students from eighteen secondary schools in eastern and southern Serbia. The inclusion criteria were as follows:

- Third grade level. The sample was drawn from both grammar schools and vocational schools. Since many vocational schools have a three-year program, only third-grade students were included in order to ensure sample consistency.
- Currently in a romantic relationship or having been in one during the previous six months. This criterion followed the instructions provided in the questionnaires.

The final analytic sample consisted of 895 adolescents who were currently in a heterosexual relationship or had been in one within the previous six months. Of these, 513 (57.3%) were women. Participants were aged between 17 and 19 years (M = 17.89, SD = 0.35). The research was approved by the Council for Ethical Issues of the Serbian Psychological Society (No 12-2019). Participation in the study was anonymous and voluntary. The questionnaires were administered in a paper-and-pencil format in classrooms (i.e., group format) during school and class hours (approximately 25 minutes). Informed consent was obtained from each participant and the parents of underage students. In the end, the participants received the contact details of a psychologist with whom they could talk if they felt the need to.

Instruments

The research used a battery of tests to examine violence in relationships between young people, developed by a group of authors from Croatia (Ajduković et al., 2011b, 2011c, 2011d, 2011e). Since the original

items were in Croatian, minimal adjustments were made during their translation into Serbian. A back-translation confirmed the consistency in the meaning of the items formulated in both Croatian and Serbian.

The Scale of False Beliefs About a Quality Relationship

The Scale of False Beliefs About a Quality Relationship (Ajduković et al., 2011c) is an 18-item (e.g., "A young man/woman must always know where and with whom his/her girlfriend/boyfriend is") measure designed to assess false beliefs about a quality relationship. Items are rated on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). In the present study, the scale demonstrated satisfactory internal consistency (α = .80).

The Knowledge of One's Own Rights in a Relationship Scale

The Knowledge of One's Own Rights in a Relationship Scale (Ajduković et al., 2011d) is a 10-item (e.g., "I can openly express my opinion") scale designed to assess knowledge of the rights that people have in romantic relationships. Items are rated on a scale from 1 (*it doesn't matter to me at all*) to 5 (*it is extremely important to me*). In this sample, the scale showed high reliability (α = .89).

The Setting Boundaries in a Relationship Scale

The Setting Boundaries in a Relationship Scale (Ajduković et al., 2011e) is a 12-item (e.g., "I would allow my boyfriend/girlfriend to determine who I will hang out with when I am not with him/her") scale designed to assess a person's ability and willingness to set personal boundaries. The items are rated on a scale from 1 (*never*) to 5 (*almost always*). A lower score on the scale indicates better ability to set boundaries in a relationship. The scale demonstrated good internal consistency in the present study (α = .85).

The Victimization in a Relationship Questionnaire

The Victimization in a Relationship Questionnaire (Ajduković et al., 2011b) is a 30-item scale designed to assess three forms of violence: psychological (19 items; e.g., "My boyfriend/girlfriend insulted or cursed me"), physical (7 items; e.g., "My boyfriend/girlfriend slapped me"), and sexual violence (4 items; e.g., "My boyfriend/girlfriend threatened me in order

to have sex"). The questionnaire was modeled on the Conflict Tactics Scale (CTS-2; Straus et al., 2003), with changes and new items added that were appropriate to the age and type of adolescent relationships, culture, and typical forms of violent behaviour among young people. The content was adapted according to the characteristic behaviors of young people who are typically not in a long-term relationship that involves living together. Respondents indicated how often they had experienced a certain form of behavior by their partner in the last 6 months, using a scale from 0 (*not at all*) to 5 (*very often/several times a week*). In the present study, internal consistency for the subscales was high: psychological violence (α = .93), physical violence (α = .89), and sexual violence (α = .80).

Data analysis

In this study, the independent variables were False beliefs about quality relationships and Knowledge of one's own rights in a relationship. The dependent variables were three forms of dating violence victimization (psychological, physical, and sexual violence). The ability to set boundaries was viewed as a mediating variable.

During the data screening, participants with more than 10% of their data missing were removed. For participants with less than 10% of missing data, the data were imputed using the expectation-maximization method (Gold & Bentler, 2000). The data were analyzed using SPSS and AMOS. SPSS 26 was used for descriptive and correlation analysis of the data, and the software AMOS 20 was adopted to assess the psychometric properties and measurement invariance of the instrument, in order to test the model fit of a mediation model, path parameters, and indirect effects. In AMOS, when testing the structural equation model (SEM), the asymptotically distribution free method (often used to estimate models without a normal distribution assumption of variables) and the bootstrap method were used.

Results

Descriptive statistics were computed to determine the percentages of participants who experienced dating violence. Table 1 shows the percentages of participants who experienced psychological, physical or sexual violence and certain manifestations of these forms of violence at least

once. The results show that the largest percentage of participants experienced psychological violence, both in the whole sample and in the subsamples.

Table 1

Percentages of Participants Who Experienced Dating Violence

	Sample	Subsample – girls	Subsample – boys
Psychological violence	60.7%	59.3%	62.6%
Physical violence	31.6%	24.4%	41.4%
Sexual violence	17.4%	12.9%	23.6%

Note. N_{boys} = 382; N_{girls}= 513.

Subsequently, Table 2 provides descriptive statistics for the study variables across the subsamples of boys and girls.

Table 2

Descriptive Statistics of the Study Variables

	M boys	*SD* boys	*Sk* boys	*Ku* boys	*M* girls	*SD* girls	*Sk* girls	*Ku* girls
False beliefs about quality relationships	2.13	.57	.59	.23	1.78	.43	1.43	4.38
Knowledge of one's own rights in a relationship	4.14	.07	-1.19	2.21	4.13	.72	-2.7	12.99
Setting the boundaries	1.70	.06	1.61	3.99	1.26	.39	3.85	23.7
Physical violence	.58	.82	2.86	8.94	.36	.60	5.28	32.4
Psychological violence	.43	.87	2.07	5.35	.16	.49	2.79	9.63
Sexual violence	.36	.88	2.99	5.35	.12	.46	5.40	9.63

Note. *Sk* – skewness; *Ku* – Kurtosis; N_{boys}= 382; N_{girls}= 513.

The Shapiro–Wilk test showed a significant departure from normality for all variables (false beliefs about quality relationships: $W(888) = .94$, $p < .001$; knowledge of one's own rights: $W(888) = .81$, $p < .001$; setting the boundaries: $W(888) = .76$, $p < .001$; physical violence: $W(888) = .45$, $p < .001$; psychological violence: $W(888) = .68$, $p < .001$; sexual violence: $W(888) = .38$, $p < .001$). Therefore, the Mann–Whitney *U* test and Spearman's correlation coefficient were used. The Mann–Whitney *U* test indicated that boys were more likely than girls to experience all forms of violence: physical violence, $U = 78{,}703$, $p < .001$; psychological violence, $U = 85{,}858.50$, $p < .001$; and sexual violence, $U = 86{,}532$, $p < .001$.

Regarding the correlations between the study variables, results (Table 3) showed that almost all variables significantly correlated with each other, with the magnitude of correlations being weak or moderate (-.12 – .67).

Table 3

Spearman's Correlations of the Variables

	1.	2.	3.	4.	5.
1. False beliefs about quality relationships	-				
2. Knowledge of one's own rights in a relationship	-.32**	-			
3. Setting the boundaries	.49**	-.34**	-		
4. Physical violence	.29**	-.12**	.36**	-	
5. Psychological violence	.23**	-.01	.22**	.67**	-
6. Sexual violence	.34**	-.13**	.30**	.23**	.39**

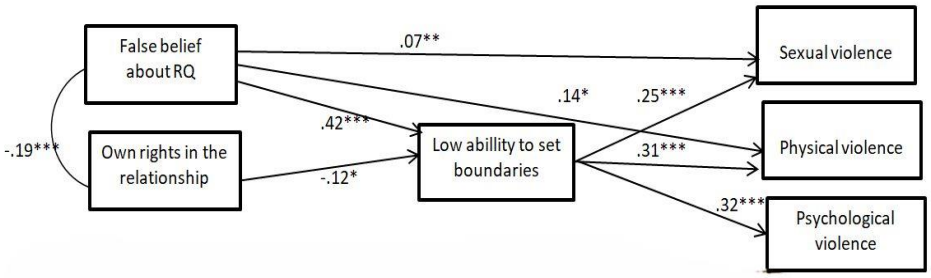
Note. **$p < .01$.

In the following analyses, we attempted to answer the question of what kind of relationship exists between knowing one's own rights and false beliefs about quality relationships and different forms of dating violence, with a special analysis of the mediating role of personal boundaries in the relationship between the aforementioned variables. This analysis was carried out using structural equation modeling. Based on previous findings, we tested the model for males and females separately.

After conducting the SEM, it was determined that the theoretically derived initial model was saturated, but some pathways were not significant. In the male subsample, the pathways from knowing one's own rights toward all forms of violence were not statistically significant and were thus deleted in the following step. By testing the second model, satisfactory fit indexes were obtained (SRMR = .01; $p(\chi^2)$ = .787, CFI = 1.000, RMSEA = .000). However, it was also determined that now, by deleting the pathways from knowing one's own rights toward all forms of violence (in the second step), the relationship between false beliefs about quality relationships and psychological violence lost its statistical significance, and so this relationship was also eliminated. In the case of the third model, fit indices were somewhat lower but still satisfactory (SRMR = .026, $p(\chi^2)$ = .344, CFI = .993, RMSEA = .018). Additionally, in the third step, we reached a more parsimonious model than in the previous one, concluding that the third model of relationships between the variables was the most acceptable one (Figure 1).

Figure 1

Proposed Model of Adolescent Dating Violence for the Male Subsample



Note. Standardized beta coefficients are presented in the diagram. All pathways are significant. Error terms and covariances (between different forms of violence) are omitted for clarity.

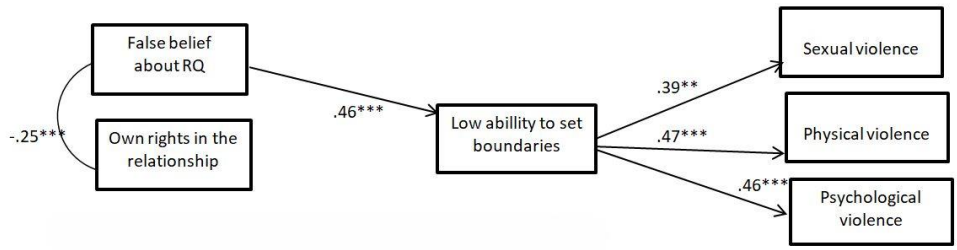
*** $p < .001$. ** $p < .01$. * $p < .05$.

The results presented in Figure 1 suggest that the total effect from false beliefs about quality relationship on physical violence was β = .20, 95% CI = [.184, .423] and β = .25, 95% CI = [.249, .594] on sexual violence, where the indirect effect through personal boundaries was significant and positive (physical: β = .13, 95% CI = [.086, .205] and sexual: β = .10, 95% CI = [.048, .177]). When it comes to psychological violence, false beliefs about quality relationships had only an indirect and positive effect (β = .13, 95%CI = [.072, .207]). Similarly, the second predictor, knowing one's own rights in the relationship had only a significant indirect effect, through setting boundaries, on all forms of dating victimization: physical (β = -.04, 95%CI = [-.084, -.002]), psychological (β = -.04, 95% CI = [-.083, -.001]) and sexual violence (β = -.03, 95% CI = [-.076, -.002]) among male adolescents.

The results of the SEM on a female subsample were different. Again, the initial model was saturated but showed that the pathway from knowing one's rights to personal boundaries was not significant, neither were any of the direct pathways from either of the predictors towards the criteria variables. After deleting non-significant paths in the following step, the model (Figure 2) with acceptable fit indices was obtained (SRMR = .07, $p(\chi^2)$ = .086, CFI = .876, RMSEA = .039).

Figure 2

Proposed Model of Adolescent Dating Violence for the Female Subsample



Note. Standardized beta coefficients are presented in the diagram. All pathways are significant. Error terms and covariances (between different forms of violence) are omitted for clarity.

*** $p < .001$. ** $p < .01$.

These results indicate that female adolescent victimization can only be explained by false beliefs about quality relationships, fully mediated by

girls' capabilities to set clear boundaries in the partnership. The total, and at the same time indirect, effect of false beliefs about the quality of a relationship on physical violence was β = .22, 95% CI = [.098, .399], on psychological violence was β = .21, 95% CI = [.080, .354], and on sexual violence was β =.18, 95% CI = [.052, .414].

Discussion

This study aimed to test the model of risk factors of adolescent dating victimization. We followed the ecological model for understanding IPV and tested a model in which false beliefs about quality relationships and knowing one's own rights in the relationship predict victimization, while the ability to set boundaries mediates these relationships.

The results suggest gender similarities and differences in the antecedents of dating violence. First, we found that false beliefs about quality relationships predict all forms of violence through the inadequate boundaries that a person sets between themselves and their partner, regardless of gender. In fact, lower ability to set boundaries is a full mediator in the relationship between false beliefs and psychological violence in boys and between false beliefs and all forms of dating violence victimization in girls. Also, it is a partial mediator in the relation between false beliefs about the quality of a relationship and physical and sexual victimization in boys. Namely, wrong beliefs about what makes a quality relationship reduce the ability to establish clear boundaries within the relationship, which may, in turn, increase the likelihood of experiencing dating violence. Such findings are consistent with those of Hutchison (2024), who reported that clear boundaries were associated with lower odds of experiencing dating violence, whereas porous, protective, and controlling boundary styles were linked to increased odds. Although that study did not examine the mediating role of boundary-setting, the importance of false beliefs about quality relationships in predicting the frequency of dating violence victimization was also confirmed in the study by Ajduković et al. (2011a).

While understanding what a quality relationship should look like has quite a similar effect and underlying mechanism for boys and girls, knowing one's rights has a different position in explaining male and female victimization in adolescence. In fact, while knowing one's rights in boys

predicts their victimization, and this is, again, mediated through the ability to set boundaries, in a female subsample, knowing one's rights was not a significant predictor of any form of violence experienced; it only had an effect through its relationship with another predictor, i.e., false beliefs about a quality relationship. Such findings suggest that male adolescent victims of dating violence are less able to set personal boundaries in a relationship when they do not attach importance to exercising certain rights, such as the right to diversity (in terms of desires, needs), the right to express one's own opinion, and disagreeing with their partner. For girls, this pattern was not observed. Their perception of personal rights within the relationship was not directly related to boundary setting or experiences of victimization.

The results may be interpreted in the context of gender differences in terms of commitment to the relationship and the importance of intimacy in the relationship. Namely, research confirms that women, due to socialization, are more invested in relationships, and that satisfaction with a relationship is assessed based on established closeness and intimacy with a partner (Duncombe & Marsden, 1993). Women are relationship-oriented, since they define their sense of self by their feelings and by the quality of their relationships (Gray, 1992). It can be assumed that for women, emphasizing their own rights in a relationship is contrary to establishing closeness and intimacy with a partner, and that, therefore, beliefs about what makes a quality relationship are important for setting boundaries, while understanding one's own rights is not. So, girls may be aware of their rights in a relationship (e.g., the right to choose or say no to a partner), but this will not be important for setting boundaries; at the same time, this awareness significantly predicts setting boundaries among men. Such findings align with the established differences in the way men and women use language: independence vs. intimacy (Tannen, 1991). If we look at the data obtained in the context of the ecological model (Dutton, 1995), we can assume that the macrosystem creates a context in which gender norms, attitudes about gender equality, human rights, and notions of quality relationships are presented and further distributed through other systems (exosystem, microsystem), resulting in numerous individual differences at the ontogenetic level.

Although Ajduković et al. (2011a) did not examine the mediating effect of boundary-setting ability, contrary to our findings, they reported that

adolescents who attached greater importance to personal rights within relationships experienced dating violence more frequently than those who valued such rights less, and this effect was independent of gender. This discrepancy may reflect differences between the Serbian and Croatian samples, including variations in social norms, cultural expectations regarding gender roles, and relationship dynamics. However, the available data do not allow for a direct test of these assumptions.

The result that adolescent young men are more likely than adolescent women to be victims of dating violence also deserves attention. The previous studies also found that, in contrast to intimate partner violence in adulthood, male adolescents are more often victims of psychological and physical violence than females (Ajduković et al., 2011a; Harned, 2001; Hammock & O'Hearn, 2002; Hodžić, 2007; Luthra & Gidycz, 2006; O'Keefe, 1997; Straus & Ramirez, 2004; Shen et al., 2012; Wolfe et al., 2001). The results obtained in terms of psychological violence can be explained by the fact that girls may not approach problem-solving adequately when their desires and needs are not met. In these situations, they are prone to psychological violence. Another possibility is that psychological violence becomes a means of attack in situations where their partners behave dominantly or even violently (Hammock & O'Hearn, 2002). As an explanation for more frequent physically violent behaviour by girls in relationships, O'Keefe (1997) states that in American culture, the media convey that in no situation is it acceptable for boys to hit girls, but they romanticize girls slapping boys. It is quite reasonable to assume that such an interpretation could be applicable to our sample as well. Some researchers have also pointed out the need to consider a developmental perspective and the conflict resolution patterns that girls and boys first adopt in same-gender friendship groups during childhood and then apply in early romantic relationships (Connolly & McIsaac, 2009; Underwood, 2007). While girls typically adopt masculine aggressive behaviors to express frustration and resolve conflict, boys are more likely to inhibit such behaviors (McIsaac et al., 2008; Rose & Rudolph, 2006; Shute & Charlton, 2006). What further encourages these behavioral styles is the greater social acceptance of violent behavior by girls towards boys in romantic relationships compared to the reverse situation. Additionally, research shows that adolescents often report that it is entirely acceptable for a girl to hit a boy (Simon et al., 2010). Another possible explanation for these

findings is that boys report experiencing violence less often than girls, or it may be that girls have become more aggressive (Jain et al., 2010).

However, while previous research indicates that girls are more often victims of sexual violence (Hodžić, 2007; Harned, 2001; Hickman et al., 2004; O'Keefe, 1997; Shen et al., 2012), or that no gender differences exist (Ajduković et al., 2011a), this was not the case in the present study. An explanation for these results may be found in the nature of the instrument used. Namely, all the items on the sexual violence subscale refer to various types of sexual coercion. Numerous studies confirm that women also use different tactics of sexual coercion in an intimate relationship to obtain sexual acts from a male partner. The tactics used range from verbal threats, threats to end the relationship, pressure and blackmail, to threats of physical force, actual physical force, and use of a weapon (Anderson & Struckman-Johnson, 1998; Krahé et al., 2003; Russell & Oswald, 2001; Oswald & Russell, 2006; Waldner-Haugrud & Magruder, 1995).

The results of our analysis were statistically significant; however, the effect sizes were small. This may suggest that knowledge of one's own rights and beliefs about what makes a quality relationship are not the only, nor the biggest, causes of dating violence. Nevertheless, this is still an important association. We may venture to say that the findings have multiple practical implications. A particularly important result of this research is the role of personal boundaries as a mediator in the relationship between dating violence and the examined variables. In many psychotherapeutic paths, this construct is highlighted, and often one of the goals of therapy is to learn to set boundaries with close people (Ball et al., 2012; Goldenberg & Goldenberg, 2008; Taylor et al., 2015). Although setting boundaries in a partnership is recognized as an important segment in prevention programs designed to combat dating violence (Joseph & Kuperminc, 2020; Taylor et al., 2013), empirical studies examining the relationship between this construct and adolescents' experiences of dating violence remain scarce. In this sense, our findings have notable theoretical significance, but also carry practical implications for efforts to prevent dating violence.

School-based youth violence prevention programs should prioritize educating adolescents about the characteristics of healthy romantic relationships. School counselors play a key role in this process by promoting

respect for one's own rights and the rights of partners, as well as by supporting the development of skills for setting and respecting personal boundaries. Educational activities such as workshops, lectures, and group discussions can help adolescents learn to express their needs and desires appropriately while respecting those of their partners. These activities may also strengthen assertive communication skills and encourage critical reflection on beliefs about dating relationships, particularly the assumption that love justifies violations of personal rights. In addition, prevention programs should include opportunities to practice emotional regulation and conflict management. Experiential methods, including role-playing, conflict simulations, and guided peer discussions, enable adolescents to rehearse constructive responses in emotionally challenging situations. Such practice increases the likelihood that acquired knowledge and skills will be transferred to real-life relationships. Finally, observed gender differences in both predictors and prevalence of dating violence victimization highlight the importance of gender-sensitive prevention programs. The value of incorporating a gender perspective has already been recognized in some existing interventions (Weisz & Black, 2001).

Despite the relevance and novelty of the topic, the present study has several limitations. First, although the sample is relatively large, it is not representative of the adolescent population in Serbia, and caution should be exercised when generalizing the findings. Second, we did not examine cyber violence as a form of dating violence, which would provide a clearer insight into the frequency of different forms of dating violence in the test sample. Third, self-assessment may not be the most appropriate method of researching sensitive topics such as partner violence. In addition to the issue of social desirability, it is possible that not all forms (e.g., subtle forms) of violence were captured by the questionnaire. Thus, future studies may consider using a qualitative approach. For instance, through interviews and/or focus groups, researchers could collect more in-depth information about the topic, thus gaining deeper insight and a better understanding of the relationships between the variables examined. Finally, while the selected variables are relevant for understanding dating violence victimization, it should be acknowledged that setting boundaries and knowledge of relationship rights have limited empirical support as predictors, and the model was primarily guided by the theoretical ecological framework. For

these reasons, future research should include a few more well-known predictor variables in addition to the variables used in this research.

Conclusion

The findings indicate that adolescents' ability to set boundaries is influenced by often inaccurate beliefs about what constitutes a quality relationship, as well as by neglecting their personal rights and freedoms. Importantly, all of these factors are modifiable through targeted educational and preventive interventions. Some violence prevention programs are already applying these findings in practice, for example by educating adolescents about healthy relationship qualities, promoting respect for personal rights, and strengthening boundary-setting skills. Educating adolescents about these aspects of healthy partnerships may help them recognize early signs of potentially harmful behavior and respond safely. However, boundary-setting skills, although valuable, need to be understood within the broader context of relationship dynamics. Accordingly, prevention efforts should also address relational processes in order to avoid unintended consequences, such as the escalation of reciprocal violence.

Funding

This work was supported by the Ministry of Science, Technological Development and Innovations of the Republic of Serbia (Contract No. 451-03-34/2026-03/200165). Prepared as a part of the project *The study and teaching of psychology, social policy, social work and the labor market in celebration of the 55th anniversary of the Faculty of Philosophy, University of Niš*, conducted at the University of Niš – Faculty of Philosophy (No. 373/1-12-01).

Conflict of interest

We have no conflicts of interest to disclose.

Data availability statement

The data that support the findings of these studies are openly available at: https://figshare.com/s/95bc218685ad01f00b84.

References

Ajduković, D., Löw, A., & Sušac, N. (2011a). Rodne razlike i prediktori partnerskog nasilja u mladenačkim vezama [Gender differences and predictors of partner violence in youth relationships]. *Ljetopis socijalnog rada*, *18*(3), 527–553.

Ajduković, D., Löw, A., & Sušac, N. (2011b). *Upitnik doživljenih nasilnih ponašanja u vezi* [Victimization in a relationship questionnaire]. Društvo za psihološku pomoć.

Ajduković, D., Löw, A., & Sušac, N. (2011c). *Skala pogrešnih uvjerenja o kvalitetnoj vezi* [Scale of false beliefs about a quality relationship]. Društvo za psihološku pomoć.

Ajduković, D., Löw, A., & Sušac, N. (2011d). *Skala važnosti prava u vezi* [Knowledge of one's own rights in a relationship scale]. Društvo za psihološku pomoć.

Ajduković, D., Löw, A., & Sušac, N. (2011e). *Skala (ne)spremnosti na postavljanje osobnih granica* [Setting boundaries in a relationship scale]. Društvo za psihološku pomoć.

Ajduković, M. & Ručević, S. (2009). Nasilje u vezama mladih [Violence in youth relationships]. *Medicus*, *18*(2), 217–225.

Anderson, P. B., & Struckman-Johnson, C. (Eds.). (1998). *Sexually aggressive women: Current perspectives and controversies*. Guilford.

Archer, J. (2000). Sex differences in aggression between heterosexual partners: A meta-analytic review. *Psychological Bulletin*, *126*(5), 651–680. https://doi.org/10.1037/0033-2909.126.5.651

Ball, B., Tharp, A. T., Noonan, R. K., Valle, L. A., Hamburger, M. E., & Rosenbluth, B. (2012). Expect Respect support groups: Preliminary evaluation of a dating violence prevention program for at-risk youth. *Violence Against Women*, *18*(7), 746–762. https://doi.org/10.1177/1077801212455188

Banyard, V. L., & Cross, C. (2008). Consequences of teen dating violence understanding intervening variables in ecological context. *Violence Against Women*, *14*(9), 998–1013. https://doi.org/10.1177/1077801208322058

Bell, K. M. & Naugle, A. E. (2008). Intimate partner violence theoretical considerations: Moving towards a contextual framework. *Clinical Psychology Review*, *28*(7), 1096–1107. https://doi.org/10.1016/j.cpr.2008.03.003

Ben-Ze'ev, A. (2011). The nature and morality of romantic compromises. In C. Bagnoli (Ed.), *Morality and the emotions* (pp. 95–114). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199577507.003.0005

Bonache, H., Gonzalez-Mendez, R., & Krahé, B. (2017). Romantic attachment, conflict resolution styles, and teen dating violence victimization. *Journal of Youth and Adolescence*, *46*(9), 1905–1917. https://doi.org/10.1007/s10964-017-0635-2

Centers for Disease Control and Prevention. (2025, January 14). *Teen Dating Violence*. https://www.cdc.gov/intimate-partner-violence/about/about-teen-dating-violence.html

Connolly, J. A., & McIsaac, C. (2009). Romantic relationships in adolescence. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology: Contextual influences on adolescent development* (3rd ed., pp. 104–151). John Wiley & Sons. https://doi.org/10.1002/9780470479193.adlpsy002005

Campbell, J. (2002). Health consequences of intimate partner violence. *Lancet, 359*(9314), 1331–1336. https://doi.org/10.1016/S0140-6736(02)08336-8

Cook, M. N. (2015). *Transforming teen behavior: Parent-teen protocols for psychosocial skills training*. Academic Press.

Currie, D. W. (1983). A Toronto model. *Social Work with Groups*, *6*(3–4), 179–188. https://doi.org/10.1300/J009v06n03_17

Duncombe, J., & Marsden, D. (1993). Love and intimacy: The gender division of emotion and 'emotion work': A neglected aspect of sociological discussion of heterosexual relationships. *Sociology*, *27*(2), 221–241. http://www.jstor.org/stable/42855173

Dutton, D. G. (2006). *Rethinking domestic violence*. UBC Press.

Dutton, D. G. (1995). *The domestic assault of women: Psychological and criminal justice perspectives*. UBC Press.

Dosil, M., Jaureguizar, J., Bernaras, E., & Sbicigo, J. B. (2020). Teen dating violence, sexism, and resilience: A multivariate analysis. *International Journal of Environmental Research and Public Health*, *17*(8), 2652. https://doi.org/10.3390/ijerph17082652

Edleson, J. L., & Tolman, R. M. (1992). *Intervention for men who batter: An ecological approach*. Sage Publications.

Gold, M. S., & Bentler, P. M. (2000). Treatments of missing data: A Monte Carlo comparison of RBHDI, iterative stochastic regression imputation, and

expectation-maximization. *Structural Equation Modeling*, *7*(3), 319–355. https://doi.org/10.1207/S15328007SEM0703_1

Goldenberg, H., & Goldenberg, I. (2008). *Family therapy: An overview* (7th ed.). Thomson Books/Cole.

Gray, J. (1992). *Men are from Mars, women are from Venus: A practical guide for improving communication and getting what you want in a relationship*. HarperCollins.

Hammock, G., & O'Hearn, R. (2002). Psychological aggression in dating relationships: Predictive models for males and females. *Violence and Victims*, *17*(5), 525–540. https://doi.org/10.1891/vivi.17.5.525.33715

Harned, M. S. (2001). Abused women or abused men? An examination of the context and outcomes of intimate partner violence. *Violence and Victims*, *16*(3), 269–285. https://doi.org/10.1891/0886-6708.16.3.269

Hickman, L. J., Jaycox, L. H., & Aronoff, J. (2004). Dating violence among adolescents: Prevalence, gender distribution, and prevention program effectiveness. *Trauma, Violence & Abuse*, *5*(2), 123–142. https://doi.org/10.1177/1524838003262332

Hodžić, A. (2007). *Nasilje ne prolazi samo od sebe: Izvještaj o istraživanju rodno uvjetovanog nasilja u adolescentskim vezama u Republici Hrvatskoj* [Violence does not pass by itself: Report on the research of gender-based violence in adolescent relationships in the Republic of Croatia]. CESI.

Hutchison, C. (2024). *The Development and Validation of an Assessment of Romantic Relationship Boundaries in Young Adults* (Doctoral dissertation, Rutgers University). https://doi.org/doi:10.7282/t3-ypvw-ak55

Jain, S., Buka, S. L., Subramanian, S. V., & Molnar, B. E. (2010). Neighborhood predictors of dating violence victimization and perpetration in young adulthood: A multilevel study. *American Journal of Public Health*, *100*(9),1737–1744. https://doi.org/10.2105/AJPH.2009.169730

Johnson, M. P. (2006). Conflict and control: Gender symmetry and asymmetry in domestic violence. *Violence Against Women*, *12*(11), 1003–1018. https://doi.org/10.1177/1077801206293328

Joseph, H. L., & Kuperminc, G. P. (2020). Bridging the siloed fields to address shared risk for violence: Building an integrated intervention model to prevent bullying and teen dating violence. *Aggression and Violent Behavior, 55,* 101506. https://doi.org/10.1016/j.avb.2020.101506

Figueredo, A. J., Gladden, P. R., & Beck, C. J. A. (2012). Intimate partner violence and life history strategy. In T. K. Shackleford & A. T. Goetz (Eds.), *The*

Oxford handbook of sexual conflict in humans (pp. 72–99). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780195396706.013.0005

Foshee, V. A., Bauman, K. E., & Linder, G. F. (1999). Family violence and the perpetration of adolescent dating violence: Examining social learning and social control processes. *Journal of Marriage and the Family*, *61*(2), 331–342. https://doi.org/10.2307/353752

Foshee, V. A., Linder, F., MacDougall, J. E., & Bangdiwala, S. (2001). Gender differences in the longitudinal predictors of adolescent dating violence. *Preventive Medicine, 32*(2), 128–141. https://doi.org/10.1006/pmed.2000.0793

Fredlanda, N. M., Ricardob, I. B., Campbell, J. C., Sharpsc, P. W., Kubc, J. K., & Yonasd, M. (2005). The meaning of dating violence in the lives of middle school adolescents: A report of a focus group study. *Journal of School Violence*, *4*(2), 95–114. https://doi.org/10.1300/J202v04n02_06

Kaura, S. A., & Lohman, B. J. (2007). Dating violence victimization, relationship satisfaction, mental health problems, and acceptability of violence: A comparison of men and women. *Journal of Family Violence, 22*(6), 367–381. https://doi.org/10.1007/s10896-007-9092-0

Kelly, U. A. (2011). Theories of intimate partner violence: From blaming the victim to acting against injustice: Intersectionality as an analytic framework. *Advances in Nursing Science, 34*(3), E29–E51. https://doi.org/10.1097/ANS.0b013e3182272388

Kinsfogel, K. M., & Grych, J. H. (2004). Interparental conflict and adolescent dating relationships: Integrating cognitive, emotional, and peer influences. *Journal of Family Psychology, 18*(3), 505–515. https://doi.org/10.1037/0893-3200.18.3.505

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). Guilford Press.

Krahé, B., Waizenhõfer, E., & Mõller, I. (2003). Women's sexual aggression against men: Prevalence and predictors. *Sex Roles: A Journal of Research, 49*(5–6), 219–232. https://doi.org/10.1023/A:1024648106477

Luthra, R., & Gidycz, C. A., (2006). Dating violence among college men and women: Evaluation of a theoretical model. *Journal of Interpersonal Violence*, *21*(6), 717–731. https://doi.org/10.1177/0886260506287312

McIsaac, C., Connolly, J., McKenney, K. S., Pepler, D., & Craig, W. (2008). Conflict negotiation and autonomy processes in adolescent romantic relationships:

An observational study of interdependency in boyfriend and girlfriend effects. *Journal of Adolescence, 31,* 691–707. https://doi.org/10.1016/j.adolescence.2008.08.005

McLeod, D. A., Havig, K., Natale, A., & Pharris, A. (2020). Intimate partner violence: Innovations in theory to inform clinical practice, policy, and research. *Social Sciences*, *9*(5), 71. http://doi.org/10.3390/socsci9050071

Mulford, C. F., & Blachman-Demner, D. R. (2013). Teen dating violence: Building a research program through collaborative insights. *Violence Against Women, 19*(6), 756–770. https://doi.org/10.1177/1077801213494705

Muñoz-Rivas, M., Ronzón-Tirado, R. C., Redondo, N., & Cassinello, M. D. Z. (2022). Adolescent victims of physical dating violence: why do they stay in abusive relationships? *Journal of Interpersonal Violence*, *37*(11–12), NP10362–NP10381. https://doi.org/10.1177/0886260520986277

Nikolić-Ristanović, V., & Dokmanović, M. (2006*). Međunarodni standardi o nasilju u porodici i njihova primena na Zapadnom Balkanu* [International standards on domestic violence and their application in the Western Balkans]. Prometej.

Niolon, P. H., Kearns, M., Dills, J., Rambo, K., Irving, S., Armstead, T., & Gilbert, L. (2017). *Preventing intimate partner violence across the lifespan: A technical package of programs, policies, and practices*. National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. https://www.cdc.gov/violenceprevention/pdf/ipv-technicalpackages.pdf

Niolon, P. H., Vivolo-Kantor, A. M., Tracy, A. J., Latzman, N. E., Little, T. D., DeGue, S., Lang, K. M., Estefan, L. F., Ghazarian, S. R., McIntosh, W. L. K., Taylor, B., Johnson, L. L., Kuoh, H., Burton, T., Fortson, B., Mumford, E. A., Nelson, S. C., Joseph, H., Valle, L. A., & Tharp, A. T. (2019). An RCT of *Dating Matters*: Effects on teen dating violence and relationship behaviors. *American Journal of Preventive Medicine*, *57*(1), 13–23. https://doi.org/10.1016/j.amepre.2019.02.022

O'Keefe, M. (1997). Predictors of dating violence among high school students. *Journal of Interpersonal Violence, 12*(4), 546–568. https://doi.org/10.1177/088626097012004005

O'Keefe, M. (2005). *Teen dating violence: A review of risk factors and prevention efforts*. VAWnet: The National Online Resource Center on Violence Against Women. https://vawnet.org/material/teen-dating-violence-review-risk-factors-and-prevention-efforts

O'Leary, K. D., Smith Slep, A. M., Avery-Leaf, S., & Cascardi, M. (2008). Gender differences in dating aggression among multiethnic high school students. *Journal of Adolescent Health, 42*(5), 473–479. https://doi.org/10.1016/j.jadohealth.2007.09.012

O'Moore, M., & Kirkham, C. (2001). Self-esteem and its relationship to bullying behaviour. *Aggressive Behavior, 27*(4), 269–283. https://doi.org/10.1002/ab.1010

Oswald, D. L., & Russell, B. L. (2006). Perceptions of sexual coercion in heterosexual dating relationships: The role of aggressor gender and tactics. *Journal of Sex Research*, *43*(1), 87–95. http://www.jstor.org/stable/20620230

Papadakaki, M., Tzamalouka, G. S., Chatzifotiou, S., & Chliaoutakis, J. (2009). Seeking for risk factors of intimate partner violence (IPV) in a Greek national sample: The role of self-esteem. *Journal of Interpersonal Violence, 24*(5), 732–750. https://doi.org/10.1177/0886260508317181

Piercy, J. (2024). *Choices, boundaries, and consent: A new power and control framework centering non-violence in domestic violence education and prevention*. Safe+Sound Somerset. https://safe-sound.org/learningcenter/choices_boundaries_consent_framework/

Plichta, S. (2004). Intimate partner violence and physical health consequences: Policy and practice implications. *Journal of Interpersonal Violence, 19*(11), 1296–1323. https://doi.org/10.1177/0886260504269685

Russell, B. L., & Oswald, D. L. (2001). Strategies and dispositional correlates of sexual coercion perpetrated by women: An exploratory investigation. *Sex Roles: A Journal of Research, 45*(1–2), 103–115. https://doi.org/10.1023/A:1013016502745

Riggs, D. S. & Caulfield, M. B. (1997). Expected consequences of male violence against their female dating partners. *Journal of Interpersonal Violence, 12*(2), 229–240. https://doi.org/10.1177/088626097012002005

Rose, A. J., & Rudolph, K. D. (2006). A review of sex differences in peer relationship processes: Potential trade-offs for the emotional and behavioral development of girls and boys. *Psychological Bulletin, 132*(1), 98–131. https://doi.org/10.1037/0033-2909.132.1.98

Rothman, E. F., Bahrami, E., Okeke, N., & Mumford, E. (2020). Prevalence of and risk markers for dating abuse–related stalking and harassment victimization and perpetration in a nationally representative sample of U.S.

adolescents. *Youth & Society, 53*(6), 955–978. https://doi.org/10.1177/0044118X20921631

Sears, H. A., Byers, E. S., & Price, E. L. (2007). The co-occurrence of adolescent boys' and girls' use of psychologically, physically, and sexually abusive behaviors in their dating relationships. *Journal of Adolescence, 30(3),* 487–504. https://doi.org/10.1016/j.adolescence.2006.05.002

Shen, A. C., Chiu, M. Y., & Gao, J. (2012). Predictors of dating violence among Chinese adolescents: The role of gender-role beliefs and justification of violence. *Journal of Interpersonal Violence*, *27*(6), 1066–1089. https://doi.org/10.1177/0886260511424497

Shute, R., & Charlton, K. (2006). Anger or compromise? Adolescents' conflict resolution strategies in relation to gender and type of peer relationship. *International Journal of Adolescence and Youth, 13*(1–2), 55–69. https://doi.org/10.1080/02673843.2006.9747966

Sigelman, C. K., Berry, C. J., & Wiles, K. A. (1984). Violence in college students' dating relationships 1. *Journal of Applied Social Psychology*, *14(*6), 530–548. https://doi.org/10.1111/j.1559-1816.1984.tb02258.x

Simon, T. R., Miller, S., Gorman-Smith, D., Orpinas, P., & Sullivan, T. (2010). Physical dating violence norms and behavior among sixth-grade students from four U.S. sites. *The Journal of Early Adolescence, 30*(3), 395–409. https://doi.org/10.1177/0272431609333301

Slee, P. T., & Rigby, K. (1993). The relationship of Eysenck's personality factors and self-esteem to bully-victim behaviour in Australian schoolboys. *Personality and Individual Differences, 14*(2), 371–373. https://doi.org/10.1016/0191-8869(93)90136-Q

Smetana, J. G., Campione-Barr, N., & Metzger, A. (2006). Adolescent development in interpersonal and societal contexts. *Annual Review of Psychology*, *57*, 255–284. https://doi.org/10.1146/annurev.psych.57.102904.190124

Stith, S., Jester, S., & Bird, G. (1992). A typology of college students who use violence in their dating relationships. *Journal of College Student Development*, *33*(5), 411–421.

Straus, M. A., Hamby, S. L., & Warren, W. L. (2003). *The conflict tactics scales handbook*. Western Psychological Services.

Straus, M. A., & Ramirez, I. L. (2004). Criminal history and assault of dating partners: The role of type of prior crime, age of onset, and gender. *Violence and Victims*, *19*(4), 413–434. https://doi.org/10.1891/vivi.19.4.413.64164

Taylor, B. G., Mumford, E. A., & Stein, N. D. (2015). Effectiveness of "shifting boundaries" teen dating violence prevention program for subgroups of middle school students. *Journal of Adolescent Health*, *56*(2), S20–S26. https://doi.org/10.1016/j.jadohealth.2014.07.004

Taylor, B. G., Stein, N. D, Mumford, E. A., & Woods, D. (2013). Shifting boundaries: An experimental evaluation of a dating violence prevention program in middle schools. *Prevention Science*, *14*(1), 64–76. https://doi.org/10.1007/s11121-012-0293-2

Tharp, A. T., Burton, T., Freire, K., Hall, D. M., Harrier, S., Latzman, N. E., Luo, F., Niolon, P. H., Ramirez, M., & Vagi, K. J. (2011). Dating Matters™: Strategies to promote healthy teen relationships. *Journal of Women's Health*, *20*(12), 1761–1765. https://doi.org/10.1089/jwh.2011.317

Tolmacz, R. (2011). Sense of entitlement in couple relationships: An attachment theory perspective. *The American Journal of Psychoanalysis, 71*(1), 37–57. https://doi.org/10.1057/ajp.2010.40

Tomaszewska, P., & Schuster, I. (2021). Prevalence of teen dating violence in Europe: A systematic review of studies since 2010. *New Directions for Child and Adolescent Development*, *2021*(178), 11–37. https://doi.org/10.1002/cad.20437

Tannen, D. (1991). *You just don't understand: Women and men in conversation*. Virago.

Underwood, M. K. (2007). Girlfriends and boyfriends diverging in middle childhood and coming together in romantic relationships. *Merrill-Palmer Quarterly, 53,* 520–526. http://dx.doi.org/10.1353/mpq.2007 .0024

van Geel, M., Goemans, A., Zwaanswijk, W., Gini, G., & Vedder, P. (2018). Does peer victimization predict low self-esteem, or does low self-esteem predict peer victimization? Meta-analyses on longitudinal studies. *Developmental Review*, *49*, 31–40. https://doi.org/10.1016/j.dr.2018.07.001

Waldner-Haugrud, L. K., & Magruder, B. (1995). Male and female sexual victimization in dating relationships: Gender differences in coercion techniques and outcomes. *Violence and Victims*, *10*(3), 203–215. https://doi.org/10.1891/0886-6708.10.3.203

Weisz, A. N., & Black, B. M. (2001). Evaluating a sexual assault and dating violence prevention program for urban youths. *Social Work Research, 25*(2), 89–102. https://doi.org/10.1093/swr/25.2.89

Williams, T. S., Connolly, J., Pepler, D., Craig, W., Laporte, L. (2008). Risk models of dating aggression across different adolescent relationships: A developmental psychopathology approach. *Journal of Consulting and Clinical Psychology, 76*(4), 622–632. https://doi.org/10.1037/0022-006X.76.4.622

Wincentak, K., Connolly, J., & Card, N. (2017). Teen dating violence: A meta-analytic review of prevalence rates. *Psychology of Violence, 7*(2), 224–241. https://doi.org/10.1037/a0040194

Winstok, Z. (2007). Toward an interactional perspective on intimate partner violence. *Aggression and Violent Behavior*, *12*(3), 348–363. https://doi.org/10.1016/j.avb.2006.12.001

Wolfe, D. A., Scott, K., Wekerle, C., & Pittman, A. L. (2001). Child maltreatment: Risk of adjustment problems and dating violence in adolescence. *Journal of the American Academy of Child & Adolescent Psychiatry*, *40*(3), 282–289. https://doi.org/10.1097/00004583-200103000-00007

Wolfe, D. A., Wekerle, C., Scott, K., Straatman, A. L., & Grasley, C. (2004). Predicting abuse in adolescent dating relationships over 1 year: The role of child maltreatment and trauma. *Journal of Abnormal Psychology*, *113*(3), 406–415. https://doi.org/10.1037/0021-843X.113.3.406

Wekerle, C., Leung, E., Wall, A. M., MacMillan, H., Boyle, M., Trocme, N., & Waechter, R. (2009). The contribution of childhood emotional abuse to teen dating violence among child protective services-involved youth. *Child Abuse & Neglect, 33*(1), 45–58. https://doi.org/10.1016/j.chiabu.2008.12.006

Zarling, A., & Berta, M. (2017). An acceptance and commitment therapy approach for partner aggression. *Partner Abuse, 8*(1), 89–109. https://doi.org/10.1891/1946-6560.8.1.89