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Research Article

The Effects of Emotional Valence and Arousal in the Free Recall of Serbian Nouns

Katarina Protić[1] and Milica Popović Stijačić [1, 2, 3] ✉

[1]*FMK Lab – Laboratory for Psychological Research of the Faculty of Media and Communications, Singidunum University, Serbia*
[2]*Department of Psychology, Faculty of Media and Communications, Singidunum University, Serbia*
[3] *Laboratory for Experimental Psychology, Faculty of Philosophy, University of Novi Sad, Serbia*

ABSTRACT

Recent studies demonstrated inconsistent patterns of results regarding emotional valence (EV) and arousal (A) in memorising words. According to the representational substitution hypothesis, emotions play a central role in representing abstract words, predicting a larger valence effect in the lexical processing of abstract words. Conversely, the multimodal induction hypothesis suggests that emotions may be more accessible for concrete words, as emotions can be readily evoked by activating relevant sensorimotor experiences. In our study, we tested these hypotheses through the incidental free recall task. During the implicit learning phase, 276 psychology students estimated different aspects (vividness of mental images associated with words, EV, and A) of the 64 Serbian nouns (32 concrete, 32 abstract). Concrete and abstract nouns were additionally divided into groups of positively and negatively valenced words that were either low or high in arousal. The stimuli were averaged for length, frequency, familiarity, age of acquisition, and context availability. The higher recall for positive words was recorded, regardless of concreteness, and for words with lower arousal. However, arousal had a distinct effect on abstract negative words, enhancing their recall. The concreteness effect was evident only for non-arousing negative words, highlighting the importance of sensory-based representations for less emotionally charged words during recall. These findings suggest that emotional experience plays a more critical role in representing abstract words, supporting the

representational substitution hypothesis. However, since we did not include neutral words, we cannot completely reject the multimodal induction assumption.

Keywords: emotional valence, arousal, concreteness, free recall

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✉ Corresponding author's email: milica.popovic.stijacic@fmk.edu.rs

Introduction

Many researchers nowadays accentuate words' emotional components, emphasising their importance for word processing and recall (Citron, Gray et al., 2014; Citron, Weekes, & Ferstl, 2014; Kousta et al., 2009; Russell, 2003). However, recent studies demonstrated inconsistent patterns of results regarding emotional valence and arousal and their effects on concrete and abstract word processing (Tornjanski, 2023; Tse & Altarriba, 2022).

It is important to distinguish between the effects of emotional valence and arousal on word processing and memorising. Since previous studies did not examine the independent effect of emotional valence and arousal on recall, we explored these effects in our study. Moreover, previous findings regarding the importance of emotions in representations of abstract and concrete words are inconsistent. Thus, words' concreteness, emotional valence, and arousal were manipulated, allowing the exploration of their separate and conjoint effects on recall.

Emotional valence and arousal of words

Emotional experience is typically defined by two primary dimensions: arousal and emotional valence (Russell, 2003). Emotional valence (EV) describes the extent to which a stimulus is positive or negative, while emotional arousal refers to intensity—whether the stimulus is exciting/agitating or calming/sedating (Citron, Gray et al., 2014; Citron, Weekes, & Ferstl, 2014; Feldman Barrett & Russell, 1998). Some researchers proposed that arousal cannot be independent of the emotional valence of stimuli (Watson et al., 1999). In contrast, some studies demonstrated the opposite by pointing out that more valenced (positive or negative) words are also more arousing than neutral words (Bradley & Lang, 1999; Citron, Weekes, & Ferstl, 2014), and negatively valenced words are more arousing than positively valenced words (Citron, Weekes, & Ferstl, 2014; Popović Stijačić et al., 2023). That is why controlling arousal in research on emotional valence is essential. In this paper, emotional valence and arousal were treated as independent factors; thus, we sampled those with high and low arousal within the groups of positive and negative words to explore their effects on recall.

Concreteness of words

Besides emotional valence and arousal, words' concreteness (i.e, the degree to which a word's meaning can be experienced by the senses) can vary as well. Previous studies showed that concrete words are recognised faster (Fliessbach et al., 2006) and reproduced more accurately than abstract words (Paivio, 1991; Popović Stijačić & Filipović Đurđević, 2022; Taylor et al., 2019). These advantages of concrete over abstract words have been referred to as *concreteness effects* and were found in various cognitive tasks, including paired associate learning, lexical decision, and free recall (Altarriba et al., 1999). We analysed this phenomenon from the perspective of dual coding theory (DCT; Paivio, 1991). The core structure of the DCT is the mental lexicon (verbal code) coupled with corresponding non-linguistic representations (non-verbal code) that contain mental images from all senses (e.g., Paivio, 1979, 1986, 2011). According to DCT, the concreteness effect can be explained by the fact that concrete words can be represented in both codes, verbal and non-verbal, and a greater number of associations later serve as an additional cue during retrieval. On the other hand, abstract words are represented only in verbal code, so they are typically less reproduced than concrete ones (Paivio, 1964).

Besides the DCT, there are also more linguistic approaches to the concreteness of words (Strik Lievers et al., 2021). For instance, the linguistic theory of concreteness explores the properties of words (their class, part of speech, mass or count, polysemy, etc.) and their relationship to concreteness. However, in this study, since the main research question was related to memory performance, concreteness was operationalized by a traditional DCT perspective.

Interaction of emotional valence and concreteness

Previous studies proposed different hypotheses and explanations about the effect of the interaction between emotional experience and words' concreteness on word processing, learning, and recall. Furthermore, previous research showed that emotional valence is differentially represented for concrete and abstract words. According to Embodiment theories, concrete words are fundamentally represented in sensorimotor

experiences of the physical world (Barsalou, 1999), while abstract words are more associated with situational events and introspective information, such as emotions (Barsalou, 2008). Unlike concrete words, abstract ones do not exist in space and time; their existence depends on human minds/language (Hale, 1988). Experiments that used fMRI demonstrated greater activation of the rostral anterior cingulate cortex during the visual recognition of abstract words (Vigliocco et al., 2014). This finding aligns with the hypothesis that abstract words may be primarily represented in emotional experiences and tend to be more emotionally valenced and arousing than concrete words (Kousta et al., 2011).

Research studies explored the interaction of EV and concreteness in recall (e.g., Tornjanski, 2023; Tse & Altarriba, 2022). Tse and Altarriba (2022) divided words into neutral, positively, and negatively valenced words, including emotion labels (e.g., *happy*, *hatred*) and emotion-laden words (e.g., *baby*, *jail*). Additionally, these groups of words were classified as concrete or abstract, while all were averaged for arousal. The dependent variable was the recall accuracy in the serial recall performance. They recorded the effect of emotional valence, where positive words had higher recall accuracy, regardless of concreteness, meaning that the interaction between concreteness and emotional valence was insignificant. The reproduction was lower when the level of arousal was higher. This research replicated the typical concreteness effect. In his study, Tornjanski (2023) manipulated words' emotional valence and concreteness while statistically controlling the arousal. Arousal was in the inverse proportion with word recall: low-arousing words were recalled more accurately than high-arousing words. The interaction between concreteness and emotional valence was significant, and concrete words were better recalled than abstract ones, but only in the group of negative words. There were no differences in recall of abstract and concrete words in the neutral and positive groups. This research did not replicate the concreteness effect, contrary to the findings of Tse and Altarriba (2022).

Although both studies controlled for arousal, these studies recorded different conjoint effects of concreteness, emotional valence, and arousal. Additionally, they used different memory tasks, cued recall (Tornjanski, 2023) and serial recall (Tse & Altarriba, 2022), respectively.

Our goal

The present study relied on two alternative views that explain the role of emotional valence in the lexical processing of concrete versus abstract words. Firstly, *the representational substitution hypothesis* suggests that emotions play a more central role in representing abstract words and predicts a larger valence effect in the lexical processing of abstract words since abstract words may be primarily grounded in emotional experiences (Yao et al., 2018). On the other hand, *the multimodal induction hypothesis* opposes this by suggesting that the EV has a more substantial relation with concrete words than abstract ones. It argues that emotions may be more accessible for concrete words, as emotions can be readily evoked by activating relevant sensorimotor experiences (Yao et al., 2018). This view relies on Embodiment theories, which predict that the representations of emotions are inherently multimodal and concrete words would engage highly interconnected sensory, motor, and affective systems (Niedenthal, 2007). Thus, according to these theories, a higher recall is expected for concrete emotional words than for abstract emotional words.

The present study aimed to test the above hypotheses (i.e., representational substitution and multimodal induction) through the implicit memory task. A factorial design was applied to explore how different arousal and emotional valence levels affect the recall of concrete and abstract words. If the emotional experience is more related to abstract words, then the different effects of the emotional experience are expected only in the group of abstract words. On the other hand, if the multimodal hypothesis is true, the different effects of the emotional experience should be recorded in both groups of words, with no interaction of concreteness and the emotional experience.

In line with DCT (Paivio, 1991), a better recall for concrete than abstract words was assumed. Further, we expected better recall for low-arousing words (Tornjanski, 2023). During incidental learning, participants estimated the vividness of mental images of words, emotional valence, or arousal of words. Based on previous research (Janković et al., 2023), we expected better recall for the words that participants estimated for a longer time, thus the most accurate reproduction for the group that rated the vividness of the mental images of the words. On the other hand, we hypothesised that

estimating the emotional dimensions would enhance the recall of words that primarily rely on the emotional experience.

Method

Participants

A total of 276 undergraduate students (31 males, 11.6%) from the Faculty of Media and Communications, Singidunum University, who are native Serbian speakers, participated in this experiment as part of the course requirements (M_{age} = 21.54, *SD* = 5.93). All participants signed informed consent forms confirming that they agreed with the researcher's explanation of the experimental procedure and its purpose. The research was approved by the Ethical Committee of the Faculty of Media and Communications.

Stimuli

The stimuli included 64 Serbian nouns collected from Popović Stijačić's normative study (2021). All words were averaged for length, objective frequency (Kostić, 1999)[1], familiarity, imageability, age of acquisition, and context availability. There were eight groups of nouns based on the level of concreteness, emotional valence, and arousal. Firstly, words were divided into two categories based on their level of concreteness (Paivio, 1968; Troche et al., 2017): 1) Concrete nouns (32 words) and 2) Abstract nouns (32 words). Further, words from each of those two categories were then divided into four subcategories based on their emotional experience (Citron Weekes, & Ferstl, 2014; levels of emotional valence and arousal): 1) Words with positive emotional valence and high level of arousal (EV+A+; arousing nouns associated with positive emotions; *pride*, *dance*); 2) Words with positive emotional valence and low level of arousal (EV+A-; calming nouns associated with positive emotions; *rest*, *beach*); 3) Words with negative emotional valence and high level of arousal (EV-A+; arousing nouns associated with negative emotions; *punishment*, *scream*); and 4) Words with negative emotional valence and low level of arousal (EV-A-; calming nouns

[1] The groups of words were additionally averaged by objective frequencies obtained from the srWaC – Serbian corpus from the web (Ljubešić & Klubička, 2016).

associated with negative emotions; *fatigue*, *swamp*). Each of those subcategories contained eight words.

As a criterion of the high and low emotional valence, we took the lower bound of the third tercile and the upper bound of the first tercile calculated on the whole sample of 2100 words from Popović Stijačić's norms (2021). Thus, words with a value higher than 4.62 were considered positively valenced, and those with a value lower than 3.82 were considered negatively valenced. The same was done for the high/low arousal criterion. Thus, words with a value greater than 4.63 were considered highly arousing, and those lower than 4.00 were non-arousing. The list of stimuli, with their psycholinguistic properties and descriptive statistics for the group of words, is presented in the Supplementary Materials (Table E).

Procedure

The experiment was conducted online, and all the data were collected within three days. Participants accessed the test from their computers using the *SoSci Survey* platform (Leiner, 2021). Participants were randomly assigned to experimental situations that differed from each other regarding the first task – the word estimation. There were three experimental groups regarding the type of estimation: 1) The vividness group (V; *N*=89) estimated the vividness of mental images of words; 2) The emotional valence group (*N*=93) estimated how much words can be associated with positive or negative emotions; and 3) The arousal group (*N*=85) estimated how much words are calming or arousing. Each participant assessed the same list of 64 nouns and eight filler words (four at the beginning and four at the end of the list), controlling the *serial position effect* (Murdock, 1962). All nouns were estimated on a five-point Likert scale (1 – words that are easily imagined almost as if they were visible in reality, totally calming, and associated with negative emotions; 3 – neutral words according to the type of assessment; 5 – words that are: not imaginable at all, totally agitating, and associated with positive emotions).

After the word rating task, participants did the mental rotation task (Ganis & Kievit, 2015), which lasted approximately 5–7 minutes. Finally, they did the incidental free recall task in which they were required to write every remembered word from the list of nouns they previously estimated into the

blank spaces. The time for this task was limited to five minutes, and participants did not have the option to finish it earlier. After the time expired, participants were asked if they used any of the mentioned memorising strategies by choosing one or more offered answers: association with words or their meanings, creating mental images associated with the words, putting the words into meaningful groups and relying on the emotional experience of words while recalling.

Design

We used a three-factor design in which we manipulated the type of word estimation between subjects and within items in the incidental learning phase. This factor had three levels: imaginability estimation, arousal estimation, and emotional valence estimation. Furthermore, we manipulated the concreteness of words (concrete and abstract words) and the emotional experience (arousal and emotional valence of words, EV+A+, EV+A-, EV-A+, EV-A-) within subjects and between items. The dependent variable was recall accuracy (coded 0 for incorrect and 1 for correct recall).

Data analysis

We used a three-factor design in which we manipulated the type of word estimation between subjects and within items in the incidental learning phase. This factor had three levels: imaginability estimation, arousal estimation, and emotional valence estimation. Furthermore, we manipulated the concreteness of words (concrete and abstract words) and the emotional experience (arousal and emotional valence of words, EV+A+, EV+A-, EV-A+, EV-A-) within subjects and between items. The dependent variable was recall accuracy (coded 0 for incorrect and 1 for correct recall).

The data were analysed with R statistical software (R Core Team, 2021) and modelled with mixed effects logistic regression using the *lme4* package (Bates et al., 2015), which allows the modelling of random effects and is a more appropriate analysis of variables with binary outcomes (Jaeger, 2008; Popović Stijačić et al., 2018). Baar's recommendation (Baar et al., 2013) for modelling the structure of random effects was applied (thus using the structure justified by the study's design). However, the model selection was data-driven; therefore, the model with the best-fit indices (highest AIK

and lowest log Likelihood) that converged and did not have a singular fit was kept. All the data and R code are available on the OSF repository (Popović Stijačić & Protić, 2025).

Results

A logistic mixed effect model was fitted to predict the accuracy of incidental free recall. The model that contained the interaction of all fixed effects was significantly better than the model without the interaction (χ^2 (17) = 35.97, p = .005; AIC = 14320):

$$response \sim ass * conc * EE + (1 \mid ID) + (1 \mid word)\dagger$$

† ass - assessment; conc - concreteness; EE - emotional experience; ID - subject ID;

The model included random intercepts of participants (formula: ~ 1 | ID) and random intercepts of words (1 | word). A more complex random structure was not adopted due to the problem of either convergence or overfitting. The model was further trimmed for residuals that exceeded 2.5 of standard error, which improved the model performance (AIC = 11510). The variance decomposition of random effects is presented at the bottom of Table 1. The explanatory power of the fixed effects was R^2= .12 (marginal R^2), and for the whole model, R^2 = .54 (conditional R^2).

The estimates of the fixed effect coefficients are also presented in Table 1. Since the intercepts of the model are set to abstract words, arousing positive words, and assessment of the vividness, we used post hoc comparison to check the differences between all the relevant categories (see Table B, C, and D in the Supplementary Materials). We recorded significantly lower recall for the group of negative non-arousing words (E-A-) compared to the group of positive arousing abstract words (E+A+; B = -1.68; z = -2.00, p = .045). Post hoc analysis (Tukey) revealed that recall was significantly higher for the positive non-arousing words compared to the negative non-arousing ones (z = 2.75, p = .03), regardless of the concreteness group. The main effect of concreteness was not recorded: (B = -1.68; z = 1.12, p = .26).

Within negative abstract words, those with higher arousal had greater recall accuracy (the difference in recall accuracy between E-A+ and E-A-

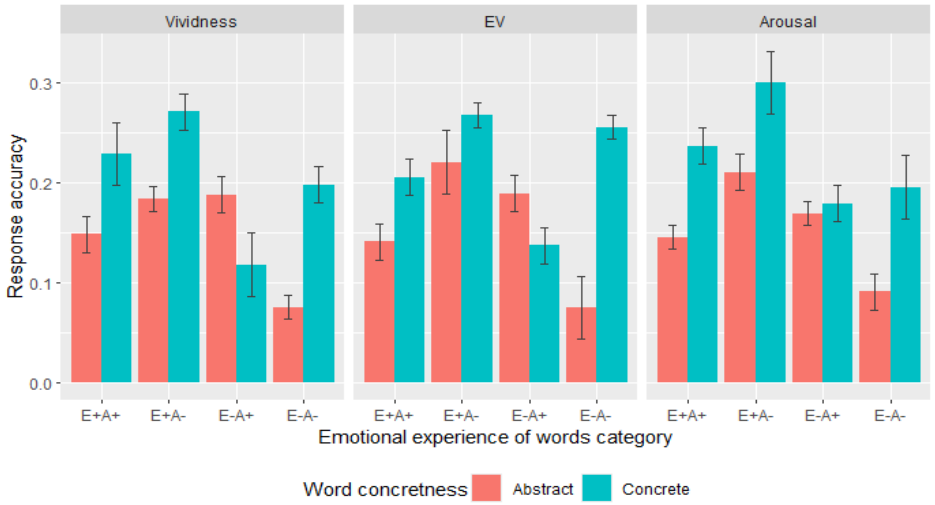
groups: z = 2.67, p = .037), meaning that higher arousal contributed to the recall accuracy of the abstract words. The abstract positive non-arousing words were recalled significantly better than the abstract negative arousing words (E+A- and E-A+ difference: z = 2.73, p = .032). Within concrete words, there was no significant difference in recall regarding the emotional experience of words.

There was an interaction between the concreteness and the emotional experience of words, meaning that the concreteness effect was recorded only in the group of negative non-arousing words (z = - 2.92, p = .003).

Further analyses revealed a significant triple interaction between the assessment group, concreteness, and emotional experience (Tables C and D in the Supplementary Materials). We found that the recall of the positive abstract non-arousing words was significantly better than the recall of the negative arousing abstract words in all three assessment groups. Within the groups of abstract negative words, those with higher arousal had greater recall accuracy compared to those with lower arousal when students rated vividness and emotional valence but not arousal (Table C in the Supplementary Materials). On the other hand, there were no significant effects of the emotional experience in the group of concrete words regardless of the assessment group. The mean recall accuracy based on the factors of the assessment, concreteness, and emotional experience of words is presented in Figure 1.

Figure 1

Mean Proportion of Correct Recall by Emotional Experience and Concreteness of Words, Clustered by Estimation Group



Note. The vertical bars denote 95% confidence intervals of the mean accuracy

Table 1

The Fixed Effects Estimates with the Fit Indices of the Model and the Random Effects Structure of the Mixed Logit Model

Predictors	Estimate	*SE*	*z* value	*p*
(Intercept)	-2.964	.575	-5.155	.000
Ass EV	-.110	.223	-.496	.620
Ass A	-.056	.227	-.247	.805
Concrete words	.893	.794	1.124	.261
EV+A-	.373	.802	.466	.641
EV-A+	.631	.799	.789	.430
EV-A-	-1.683	.840	-2.005	**.045**
Ass EV: Concrete w	-.175	.244	-.716	.474
Ass A: Concrete w	.090	.246	.367	.714

Ass EV: EV+A-	.530	.247	2.157	**.031**
Ass A: EV+A-	.343	.252	1.363	.173
Ass EV: EV-A+	.114	.244	.469	.639
Ass A: EV-A+	-.157	.251	-.626	.531
Ass EV: EV-A-	-.109	.346	-.315	.753
Ass A: EV-A-	.401	.329	1.219	.223
Concrete w: EV+A-	.360	1.117	.322	.748
Concrete w: EV-A+	-1.931	1.127	-1.713	.087
Concrete w: EV-A-	1.359	1.153	1.178	.239
Ass EV: Concrete w: EV+A-	-.311	.319	-.974	.330
Ass A: Concrete w: EV+A-	-.212	.324	-.654	.513
Ass EV: Concrete w: EV-A+	.656	.351	1.873	.061
Ass A: Concrete w: EV-A+	1.130	.353	3.204	**.001**
Ass EV: Concrete w: EV-A-	.995	.408	2.439	**.015**
Ass A: Concrete w: EV-A-	-.450	.398	-1.13	.258
Random effects				
σ^2	3.29			
$\tau_{00\ ID}$	.62			
$\tau_{00\ word}$	2.43			
Observations	16624			
Marginal R^2	0.118			
Conditional R^2	0.543			

Note. Intercept is set to abstract word, assessment of vividness, and EV+A+ emotional experience. Ass EV - assessment of emotional valence; Ass A - assessment of arousal; Concrete w - concrete words; CI - confidence intervals; Marginal R^2 - R^2 for the model with only fixed effects; Conditional R^2 - R^2 for the model with both fixed and random effects; σ^2 – overall variance of random effects; $\tau_{00\ ID}$ – variance of the random intercept from the participants; $\tau_{00\ word}$ – variance of the random intercept from the words.

Discussion

This study explored the influence of emotional experience related to concrete and abstract words in free recall, aiming to shed light on the debate about whether emotional experience is particularly relevant for representations of abstract words. Two views were contrasted (i.e., the representation substitution and the multimodal induction hypothesis; Yao et al., 2018), and several effects were tested: the emotional experience effect, the concreteness effect, the effect of the implicit learning task, and their interactions.

In line with previous studies (Tornjanski, 2023; Tse & Altarriba, 2022), a higher recall of the positively valenced words, regardless of concreteness, and more accurate recall of the words with lower arousal were recorded (Tornjanski, 2023). This advantage of positive word recall is usually explained by Pollyanna's Principle (Boucher & Osgood, 1969), according to which most people have a tendency toward pleasant stimuli. However, the lower recall accuracy for arousing stimuli is harder to explain, especially knowing that those stimuli are recognised faster in word processing tasks (i.e., the arousal has a facilitative effect; Kousta et al., 2011).

A significant interaction between emotional experience and concreteness was observed as (1) the different effects of emotional experience in each group and (2) the selective concreteness effect, present only in the negative non-arousing group of words. Concerning the first observation, within abstract negative words, we noted that non-arousing words had lower recall accuracy than arousing words. This suggests arousal enhanced the reproduction of negative abstract nouns, serving as an additional cue that helped their retrieval. Such differences were not recorded in the group of concrete words. Regarding the second observation, like in Tornjanski's study (2023), the interaction between emotional experience and concreteness was obtained, with the concreteness effect noted only in the non-arousing negative group of words. The lack of the emotional experience effect in the group of concrete words aligns with the representational substitution hypothesis. However, the selective concreteness effect observed only in the negative, non-arousing group remains unexplained.

However, our results, along with Tornjanski's findings (2023), contradict the studies and theories that emphasise the role of arousal in memory retrieval (Kensinger, 2009). Our results are partially in line with the findings of Adelman and Estes (2013). They used the Big Data approach and recognition task on 2500 words and found only the effect of emotional valence but not the effect of arousal. Thus, our results showed that arousal enhanced the recall only for abstract negative words. If the negative arousing words automatically drive attention, greater recall accuracy would be expected for such stimuli, regardless of the concreteness.

Several theoretical perspectives emphasise the interaction between recall retention and arousal. One such perspective is the perseverative consolidation hypothesis (Kleinsmith & Kaplan, 1963), which argues that recall retention duration interacts with arousal. According to this hypothesis, high-arousal words have an advantage over low-arousal words in long-term retention, whereas low-arousal words are recalled better in immediate or short-delay conditions.

Concerning the emotional valence, Kensinger (2009) argued that negative stimuli are more connected to the activation of the brain regions engaged in sensory-motor processing (visual cortex and fusiform gyrus), while positive stimuli are related to the regions involved in semantic and conceptual processing (lateral prefrontal and temporal regions). We hypothesised that such a pattern of results could be explained by the engagement of the visual brain regions during the mental rotation task, which was administered between the learning and retrieval phases. In other words, the activation of sensory regions during the pause could have prevented the memory consolidation of negative words.

Although the incidental learning tasks were designed to promote the activation of sensory-motor information (assessment of vividness) or emotional information (assessment of emotional valence and arousal), no recall advantage was observed for concrete negative words when vividness was rated, nor for positive words when valence or arousal was assessed.

In this study, arousal was varied as an independent factor instead of only being statistically controlled, as was the case in previous studies (Tse & Altarriba, 2022; Tornjanski, 2023). All words were averaged for length, objective frequency, familiarity, imageability, age of acquisition, and context

availability. Additionally, by redirecting participants' attention towards specific semantic facets, we were able to investigate whether prioritizing the sensory or emotional aspect would contribute to differences in word reproduction relative to concreteness or emotional experience.

The absence of a neutral word group precludes us from drawing a comprehensive conclusion regarding the acceptance of the multimodal induction hypothesis. Additionally, the current study noted a generally low recall accuracy, suggesting that future research should be conducted without an inserted pause between incidental learning and reproduction.

Conclusion

Our research showed that emotional experience and word concreteness contribute to abstract and concrete word recall: a greater recall for positive words and those with low arousal was recorded. These results align more with the representational substitution hypothesis, according to which emotional experience is more relevant for representations of abstract words. Emphasising the sensory or emotional processes during the implicit learning phase, we did not detect differences in the recall of concrete or abstract words. One possible explanation for the lack of the potential boosting effect of the sensory process during retrieval is that participants paused between learning and recalling while doing mental rotation tasks, which put a load on visual processing. Future studies should explore this possibility by utilising a pause without a task or testing immediate recall.

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Conflict of interest

We have no conflicts of interest to disclose.

Data availability statement

The data from this study, along with the R statistical codes, are available on the author's OSF page (link to the OSF repository).

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Supplementary Materials

Table A

Descriptive statistics of the words, grouped by concreteness and emotional experience

Variables	Emotional experience	Word concreteness	Mean	Std. Deviation	N
logF	EV+A+	Abstract	4.124	1.045	8
		Concrete	4.22	1.773	8
		Total	4.172	1.407	16
	EV+A-	Abstract	4.683	1.36	8
		Concrete	4.7	1.072	8
		Total	4.692	1.183	16
	EV-A+	Abstract	4.244	.892	8
		Concrete	4.138	1.025	8
		Total	4.191	.93	16
	EV-A-	Abstract	3.396	1.174	8
		Concrete	3.6	1.889	8
		Total	3.498	1.523	16
	Total	Abstract	4.112	1.173	32
		Concrete	4.165	1.473	32
		Total	4.138	1.321	64
Length	EV+A+	Abstract	6.25	1.035	8
		Concrete	6.125	1.356	8
		Total	6.188	1.167	16
	EV+A-	Abstract	5.875	1.458	8
		Concrete	6.625	1.847	8
		Total	6.25	1.653	16
	EV-A+	Abstract	5.5	1.414	8
		Concrete	6	2.07	8
		Total	5.75	1.732	16
	EV-A-	Abstract	6.75	1.909	8

		Concrete	5.875	1.356	8
		Total	6.313	1.662	16
		Abstract	6.094	1.489	32
	Total	Concrete	6.156	1.629	32
		Total	6.125	1.548	64
		Abstract	3.22	.641	8
	EV+A+	Concrete	5.272	.751	8
		Total	4.246	1.257	16
		Abstract	2.912	.63	8
	EV+A-	Concrete	5.615	.705	8
		Total	4.263	1.538	16
		Abstract	3.072	.525	8
Concreteness	EV-A+	Concrete	5.356	.895	8
		Total	4.214	1.376	16
		Abstract	3.118	.707	8
	EV-A-	Concrete	5.748	.683	8
		Total	4.433	1.515	16
		Abstract	3.08	.608	32
	Total	Concrete	5.498	.751	32
		Total	4.289	1.394	64
		Abstract	3.835	1.214	8
	EV+A+	Concrete	5.459	1.132	8
		Total	4.647	1.41	16
		Abstract	3.926	1.578	8
	EV+A-	Concrete	5.997	.784	8
		Total	4.961	1.61	16
Imageability		Abstract	3.304	.768	8
	EV-A+	Concrete	5.576	1.019	8
		Total	4.44	1.462	16
		Abstract	3.701	.487	8
	EV-A-	Concrete	5.912	.941	8
		Total	4.806	1.352	16

		Abstract	3.691	1.068	32
	Total	Concrete	5.736	.956	32
		Total	4.714	1.44	64
Emotional valence	EV+A+	Abstract	5.964	.366	8
		Concrete	5.899	.488	8
		Total	5.931	.418	16
	EV+A-	Abstract	5.509	.881	8
		Concrete	5.917	.488	8
		Total	5.713	.72	16
	EV-A+	Abstract	2.518	.377	8
		Concrete	2.614	.441	8
		Total	2.566	.399	16
	EV-A-	Abstract	2.953	.423	8
		Concrete	3.106	.289	8
		Total	3.03	.359	16
	Total	Abstract	4.236	1.629	32
		Concrete	4.384	1.612	32
		Total	4.31	1.609	64
Arousal	EV+A+	Abstract	5.034	.664	8
		Concrete	5.431	.492	8
		Total	5.232	.601	16
	EV+A-	Abstract	3.174	.471	8
		Concrete	3.023	.502	8
		Total	3.098	.477	16
	EV-A+	Abstract	5.645	.398	8
		Concrete	5.387	.409	8
		Total	5.516	.412	16
	EV-A-	Abstract	3.341	.599	8
		Concrete	3.664	.226	8
		Total	3.502	.468	16
	Total	Abstract	4.298	1.199	32
		Concrete	4.376	1.147	32

		Total	4.337	1.164	64
		Abstract	5.159	.52	8
	EV+A+	Concrete	5.388	.916	8
		Total	5.274	.729	16
		Abstract	5.228	.717	8
	EV+A-	Concrete	5.46	1.009	8
		Total	5.344	.854	16
		Abstract	4.909	.884	8
Familiarity	EV-A+	Concrete	4.857	1.048	8
		Total	4.883	.937	16
		Abstract	5.284	.567	8
	EV-A-	Concrete	4.85	1.155	8
		Total	5.067	.907	16
		Abstract	5.145	.669	32
	Total	Concrete	5.139	1.026	32
		Total	5.142	.859	64
		Abstract	5.364	.34	8
	EV+A+	Concrete	5.922	.707	8
		Total	5.643	.608	16
		Abstract	5.191	.674	8
	EV+A-	Concrete	5.988	.649	8
		Total	5.59	.76	16
		Abstract	5.078	.284	8
Context availability	EV-A+	Concrete	5.235	.581	8
		Total	5.156	.449	16
		Abstract	5.254	.422	8
	EV-A-	Concrete	5.158	.613	8
		Total	5.206	.511	16
		Abstract	5.222	.445	32
	Total	Concrete	5.576	.72	32
		Total	5.399	.62	64
AoA	EV+A+	Abstract	6.634	1.24	8

	Concrete	7.658	2.943	8
	Total	7.146	2.245	16
	Abstract	7.536	2.156	8
EV+A-	Concrete	5.915	2.104	8
	Total	6.726	2.222	16
	Abstract	7.878	1.555	8
EV-A+	Concrete	6.425	1.886	8
	Total	7.151	1.83	16
	Abstract	7.233	.805	8
EV-A-	Concrete	6.288	1.797	8
	Total	6.76	1.431	16
	Abstract	7.32	1.518	32
Total	Concrete	6.571	2.22	32
	Total	6.946	1.924	64

Table B

Multiple comparisons (Tukey correction) by concreteness and emotional experience averaged by the assessment group

Group level	contrast	groups	estimate	SE	df	z.ratio	p.value
abstract	E+A+	E+A-	-.8983	.788	Inf	-.843	.834
	E+A+	E-A+	-.9114	.788	Inf	-.782	.865
	E+A+	E-A-	1.7688	.818	Inf	1.939	.212
	E+A-	E-A+	-.0131	.792	Inf	-060	.999
	E+A-	**E-A-**	**2.2595**	**.822**	**Inf**	**2.73**	**.028**
	E-A+	**E-A-**	**2.2018**	**.822**	**Inf**	**2.67**	**.027**
concrete	E+A+	E+A-	-.850	.783	Inf	-1.084	.699
	E+A+	E-A+	.719	.790	Inf	.911	.799
	E+A+	E-A-	.045	.791	Inf	.057	.999
	E+A-	E-A+	1.569	.788	Inf	1.99	.192
	E+A-	E-A-	.895	.789	Inf	1.134	.668
	E-A+	E-A-	-.674	.794	Inf	-.848	.831
E+A+	abstract	concrete	-.865	.783	Inf	-1.104	.269
E+A-	abstract	concrete	-1.05	.785	Inf	-1.337	.181
E-A+	abstract	concrete	.471	.792	Inf	.594	.552
E-A-	**abstract**	**concrete**	-2.405	.822	**Inf**	-2.926	.003

Table C

Multiple Comparisons (Tukey correction) of the recall of abstract words and concrete for EE categories for the assessment of Vividness, Emotional valence, and Arousal

Comparison of the recall of abstract words for EE categories for the assessment of Vividness

contrast		estimate	SE	Df	z.ratio	p.value
EV+A+	EV+A-	-.3734	.801	Inf	-.466	.9664
EV+A+	EV-A+	-.6309	.799	Inf	-.789	.8594
EV+A+	EV-A-	1.6828	.839	Inf	2.005	.1861
EV+A-	EV-A+	-.2575	.803	Inf	-.321	.9886
EV+A-	EV-A-	2.0561	.844	Inf	2.437	.0703
EV-A+	**EV-A-**	2.3136	.843	Inf	2.744	.0309

Comparison of the recall of abstract words for EE categories for the assessment of EV

contrast		estimate	SE	Df	z.ratio	p.value
EV+A+	EV+A-	-.9032	.8	Inf	-1.129	.6718
EV+A+	EV-A+	-.7451	.801	Inf	-.93	.7885
EV+A+	EV-A-	1.7917	.845	Inf	2.12	.1468
EV+A-	EV-A+	.1581	.801	Inf	.197	.9973
EV+A-	**EV-A-**	2.6949	.846	Inf	3.185	**.0079**
EV-A+	**EV-A-**	2.5368	.847	Inf	2.995	**.0146**

Comparison of the recall of abstract words for EE categories for the assessment of A

contrast		estimate	SE	Df	z.ratio	p.value
EV+A+	EV+A-	-.7161	.802	Inf	-.893	.8087
EV+A+	EV-A+	-.4734	.803	Inf	-.589	.9353
EV+A+	EV-A-	1.2815	.837	Inf	1.531	.4185
EV+A-	EV-A+	.2426	.804	Inf	.302	.9905
EV+A-	EV-A-	1.9976	.838	Inf	2.384	.0802
EV-A+	EV-A-	1.7549	.839	Inf	2.091	.1561

Comparison of the recall of concrete words for EE categories for the assessment of Vividness

contrast		estimate	SE	Df	z.ratio	p.value
EV+A+	EV+A-	-.7329	.792	Inf	-.926	.7911
EV+A+	EV-A+	1.3002	.805	Inf	1.614	.3705
EV+A+	EV-A-	.3242	.801	Inf	.405	.9776
EV+A-	EV-A+	2.0331	.803	Inf	2.531	.0553
EV+A-	EV-A-	1.0571	.798	Inf	1.325	.5472
EV-A+	EV-A-	-.976	.811	Inf	-1.203	.6248

Comparison of the recall of concrete words for EE categories for the assessment of EV

contrast		estimate	SE	Df	z.ratio	p.value
EV+A+	EV+A-	-.9518	.793	Inf	-1.201	.6263
EV+A+	EV-A+	.5296	.802	Inf	.66	.9119
EV+A+	EV-A-	-.5617	.799	Inf	-.703	.8961
EV+A-	EV-A+	1.4814	.799	Inf	1.855	.2478
EV+A-	EV-A-	.3901	.796	Inf	.49	.9613
EV-A+	EV-A-	-1.0913	.804	Inf	-1.357	.5267

Comparison of the recall of concrete words for EE categories for the assessment of A

contrast		estimate	SE	Df	z.ratio	p.value
EV+A+	EV+A-	-.8638	.792	Inf	-1.09	.6955
EV+A+	EV-A+	.3273	.799	Inf	.41	.9768
EV+A+	EV-A-	.373	.802	Inf	.465	.9666
EV+A-	EV-A+	1.1911	.796	Inf	1.495	.4402
EV+A-	EV-A-	1.2367	.799	Inf	1.548	.4085
EV-A+	EV-A-	.0456	.805	Inf	.057	.9999

Table D

Multiple comparisons (Tukey correction) Abstract and Concrete pairs by Assessment and Emotional Experience

Assessment	Emotional experience	Difference	Estimate	SE	df	z.ratio	p.value
Vividness	E+A+	Ab-Conc	-.893	.794	Inf	-1.124	.2608
	E+A-	Ab-Conc	-1.252	.795	Inf	-1.575	.1152
	E-A+	Ab-Conc	1.038	.808	Inf	1.285	.1989
	E-A-	Ab-Conc	-2.251	.843	Inf	-2.671	**.0076**
Emotional valence	E+A+	Ab-Conc	-.718	.797	Inf	-.901	.3676
	E+A-	Ab-Conc	-.766	.793	Inf	-.966	.3339
	E-A+	Ab-Conc	.557	.804	Inf	.693	.4884
	E-A-	Ab-Conc	-3.071	.845	Inf	-3.634	**.0003**
Arousal	E+A+	Ab-Conc	-.983	.797	Inf	-1.234	.2173
	E+A-	Ab-Conc	-1.131	.794	Inf	-1.423	.1546
	E-A+	Ab-Conc	-.182	.803	Inf	-.227	.8204
	E-A-	Ab-Conc	-1.892	.839	Inf	-2.256	**.0241**

Table E

The stimuli list, with the means on the control variables

WORD	Conc cat	EE cat	logf	Len	Con	Img	EV	Arous	Fa	CA	AoA
PONOS	1.00	1.00	4.86	5.00	2.07	2.56	6.06	4.75	5.63	5.47	8.44
DOBITAK	1.00	1.00	3.37	7.00	2.72	3.35	6.35	5.94	5.18	5.27	7.60
ZNANJE	1.00	1.00	5.03	6.00	3.24	3.35	5.82	4.33	5.75	5.59	6.44
REKORD	1.00	1.00	4.45	6.00	3.44	3.41	5.65	4.71	4.67	5.61	7.00
BLAGO	1.00	1.00	4.86	5.00	3.94	6.59	5.35	4.63	5.56	4.89	5.08
NAGRADA	1.00	1.00	5.05	7.00	3.94	4.26	6.47	6.00	5.39	5.82	4.68
DIVOTA	1.00	1.00	2.89	6.00	3.53	3.32	5.89	4.47	4.29	4.88	6.91
AVANTURA	1.00	1.00	2.48	8.00	2.88	3.84	6.12	5.44	4.81	5.39	6.92
POVERENJE	1.00	2.00	4.83	9.00	2.00	2.47	5.80	3.33	6.35	4.53	7.64
SVRHA	1.00	2.00	4.74	5.00	2.29	2.00	5.17	3.82	4.82	4.67	9.16
SVEMIR	1.00	2.00	4.56	6.00	2.41	5.65	4.44	3.53	4.78	5.18	7.84
IDILA	1.00	2.00	1.79	5.00	2.71	3.24	6.39	2.94	4.35	5.24	10.44
ODMOR	1.00	2.00	5.09	5.00	3.35	4.16	6.59	2.44	5.81	5.65	5.51
JESEN	1.00	2.00	6.72	5.00	3.50	6.41	4.13	3.47	5.35	6.19	4.08
NEŽNOST	1.00	2.00	5.16	7.00	3.50	4.71	6.00	3.22	5.82	5.82	6.20
SKLAD	1.00	2.00	4.57	5.00	3.53	2.78	5.56	2.63	4.53	4.26	9.42
NEMIR	1.00	3.00	5.97	5.00	2.44	3.37	2.00	6.06	4.82	5.06	7.48
PREVARA	1.00	3.00	3.64	7.00	3.11	2.59	2.13	6.06	5.12	5.44	8.08
KAZNA	1.00	3.00	4.92	5.00	3.69	3.39	2.53	5.18	6.18	5.06	4.96
KAJANJE	1.00	3.00	3.81	7.00	2.61	2.41	2.24	5.47	4.88	4.79	8.52
PRKOS	1.00	3.00	4.09	5.00	2.65	2.89	3.00	5.47	3.63	4.63	8.28
OPTUŽBA	1.00	3.00	3.71	7.00	2.88	3.26	2.61	5.50	4.06	5.00	8.66
BES	1.00	3.00	4.63	3.00	3.89	4.89	2.65	6.19	6.06	5.24	6.76
POROK	1.00	3.00	3.18	5.00	3.31	3.63	3.00	5.24	4.53	5.41	10.28
DOSADA	1.00	4.00	4.20	6.00	2.12	3.42	2.82	2.27	6.50	5.89	5.74
SLABOST	1.00	4.00	4.79	7.00	3.75	3.84	2.61	2.63	5.33	5.18	6.92
MOLBA	1.00	4.00	5.12	5.00	3.82	3.33	3.17	3.88	5.22	5.71	8.08
ZAMOR	1.00	4.00	2.56	5.00	3.29	4.37	3.06	3.26	4.65	5.19	7.48
GAŠENJE	1.00	4.00	2.71	7.00	3.78	4.28	3.11	3.44	5.31	5.50	6.52
OZBILJNO	1.00	4.00	2.94	10.00	3.00	3.53	3.75	3.88	5.33	5.06	7.36
NERAD	1.00	4.00	1.79	5.00	3.12	2.94	2.75	3.76	5.24	4.63	7.68
BOLOVANJ	1.00	4.00	3.04	9.00	2.06	3.89	2.35	3.61	4.69	4.88	8.08
STRAST	2.00	1.00	5.84	6.00	4.71	3.71	6.06	5.79	5.11	6.39	11.16
LETO	2.00	1.00	6.19	4.00	5.00	6.47	6.24	5.35	6.69	6.41	3.96
RITAM	2.00	1.00	4.87	5.00	5.29	5.11	5.82	4.88	5.94	5.58	7.32
KONCERT	2.00	1.00	5.92	7.00	5.82	5.89	6.24	5.88	5.37	6.50	6.54
IGRANKA	2.00	1.00	3.78	7.00	4.29	5.67	5.75	5.18	4.00	4.71	8.16
SMEJANJE	2.00	1.00	3.47	8.00	6.17	6.82	6.59	5.53	6.33	6.56	4.00
PASOŠ	2.00	1.00	2.08	5.00	6.29	6.06	5.06	4.72	5.25	6.12	8.04
EROTIKA	2.00	1.00	1.61	7.00	4.60	3.94	5.44	6.12	4.41	5.11	12.08
SVITANJE	2.00	2.00	5.45	8.00	5.29	5.94	5.71	2.74	5.25	5.88	7.36
JEZERO	2.00	2.00	5.83	6.00	5.35	6.88	5.17	3.11	4.38	6.06	5.08
MILOVANJE	2.00	2.00	4.04	9.00	5.47	5.11	6.38	3.16	4.88	5.59	6.68

PLAŽA	2.00	2.00	3.30	5.00	5.67	6.79	5.94	2.33	5.71	6.50	4.89
PRIJATEL	2.00	2.00	5.94	9.00	5.71	5.58	6.76	3.89	6.88	6.41	4.72
GITARA	2.00	2.00	3.89	6.00	6.33	6.32	5.94	3.50	5.94	6.06	5.56
KREVET	2.00	2.00	5.46	6.00	6.72	6.58	5.88	2.61	6.60	6.75	3.03
OAZA	2.00	2.00	3.69	4.00	4.38	4.78	5.56	2.84	4.06	4.67	10.00
METAK	2.00	3.00	5.23	5.00	5.59	6.17	2.53	5.47	4.35	5.28	7.24
BUKA	2.00	3.00	4.09	4.00	5.83	6.63	3.12	5.71	5.88	5.65	4.84
OTROV	2.00	3.00	4.75	5.00	5.94	5.12	2.33	4.82	4.59	6.05	5.92
PAUK	2.00	3.00	4.67	4.00	6.65	6.44	3.29	5.32	6.13	5.33	3.76
VRISAK	2.00	3.00	4.94	6.00	5.65	6.00	2.84	6.13	4.31	4.89	5.36
GLAVOBOLJA	2.00	3.00	2.08	10.00	4.94	5.58	2.18	5.47	5.83	5.70	6.40
VEŠALA	2.00	3.00	3.97	6.00	4.25	5.22	2.06	5.19	3.00	4.67	9.48
NEPOGODA	2.00	3.00	3.37	8.00	4.00	3.44	2.56	5.00	4.76	4.31	8.40
IGLICA	2.00	4.00	3.14	6.00	5.63	6.16	2.78	3.94	3.39	4.82	4.98
MOČVARA	2.00	4.00	3.66	7.00	5.71	6.29	2.88	3.67	3.29	4.55	6.92
SPOMENIK	2.00	4.00	5.19	8.00	6.06	6.06	3.12	3.84	5.88	5.06	8.04
SIVILO	2.00	4.00	1.39	6.00	4.59	5.68	2.71	3.33	4.44	4.75	7.36
OPUŠAK	2.00	4.00	1.79	6.00	6.38	6.26	3.28	3.76	4.39	5.35	7.96
BARA	2.00	4.00	3.99	4.00	6.19	6.28	3.22	3.82	5.50	4.81	4.00
KOPIJA	2.00	4.00	2.48	6.00	4.94	3.72	3.44	3.59	5.47	5.44	7.40
KIŠA	2.00	4.00	7.16	4.00	6.50	6.84	3.44	3.35	6.44	6.47	3.64

Note: Conc cat – 1 abstract, 2 concrete word; EE cat – 1 E+A+, 2 – E+A-, 3 – E-A+, 4 – E-A-; Con – mean concreteness; CA – mean context availability; Len – length of word; logf – logarithm of word frequency; Fa – familiarity; AoA – age of acquisition.

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Research Article

AI in psychiatry: Perspectives of patients from Southeast Europe on ChatGPT

Goran Arbanas[1,2] ✉, Jelena Sušac[1], Ante Periša[1], Mirela Badurina[3], Ivan Biliškov [4,5], and Dahna Arbanas[6]

[1] *University Psychiatric Hospital Vrapče, Zagreb, Croatia*
[2] *Medical School of Rijeka, Rijeka, Croatia*
[3] *BHIDAPA, Sarajevo, Bosnia and Herzegovina*
[4] *Codeasy, Split, Croatia*
[5] *University of Split, Split, Croatia*
[6] *Karlovac Pharmacies, Karlovac, Croatia*

ABSTRACT

The integration of Artificial Intelligence (AI) into healthcare presents new possibilities and challenges. Large Language Models have shown potential in various psychiatric applications. However, the perspectives of patients with mental disorders on the use of such technologies remain underexplored. The present study aimed to evaluate the perceptions of patients with diagnosable mental disorders regarding the advantages and drawbacks of using ChatGPT for acquiring information about their conditions and medications. The data were collected at major psychiatric centres in Croatia and Bosnia and Herzegovina throughout October 2023. The sample consisted of 89 outpatients. The procedure involved inviting outpatients to participate in a questionnaire-based study that assessed their internet access, prior use of ChatGPT, and, after using ChatGPT to inquire about their mental health conditions and medications, their experiences interacting with ChatGPT. Data were analyzed using descriptive statistics, chi-square tests, t-tests, and logistic regression. The study found that 47.2% of the participants had used ChatGPT before. The main advantages noted were ChatGPT's availability and immediate response capability. However, significant drawbacks included the lack of personal contact and the generality of the responses. Participants expressed concerns about the quality and specificity of information regarding their medical conditions. While ChatGPT offers notable advantages such as accessibility and promptness, the lack of

emotional engagement and the sometimes vague nature of its responses limit its effectiveness from the patients' perspective. These findings suggest a need for enhancements in AI technologies to better address the unique needs and preferences of psychiatric patients.

Keywords: artificial intelligence, ChatGPT, mental disorder, personal experience

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✉ Corresponding author's email: arbanasgor@gmail.com

Introduction

Artificial intelligence (AI) (a term coined by computer scientist John McCarthy) is a field that involves technologies and applications that aim to simulate human intelligence (Ferdush et al., 2023; Graham et al., 2019). The use of AI in psychiatry dates back to the 1960s, with computer programs supporting diagnostic decisions and the creation of treatment plans. For instance, they could predict the suitability of specific medications for individual patients (Van Dellen, 2023). Furthermore, AI has been used to predict suicide based on fewer predictors or based on unstructured texts, to predict depression based on sociodemographics and comorbid conditions or based on social media posts, to predict which patients will respond to which medication, to distinguish unipolar from bipolar disorder based on EEG, and to increase medication adherence in patients with schizophrenia (Graham et al., 2019). The accuracies ranged from 62 to 98% (lower for smartphone data and higher for physical function measurements and sociodemographic data) (Graham et al., 2019).

Large language models (LLMs) are complex deep-learning programmes capable of comprehending and producing text in a manner that is comparable to that of humans. They can summarise, translate, predict, and create texts (Garg et al., 2023). A chatbot is a type of software that creates text akin to human-like conversation; therefore, some call chatbots conversational artificial intelligence (Amram et al., 2023). Chat Generative Pre-trained Transformer (ChatGPT) is one such chatbot (LLM), launched on November 30, 2022, by San Francisco-based OpenAI (Galido et al., 2023; Singh, 2023). ChatGPT was trained on a massive amount of culled textual data and can generate human-like responses (i.e., it can replicate human discourse; Galido et al., 2023). It generates responses via an autoregressive statistical model, which outputs a word based on the probabilities of different words following the previous ones, i.e. it produces text that is statistically a good fit, given the prompt text (Amram et al., 2023; Eshghie & Eshghie, 2023). Words are represented as vectors, with certain values calculated based on the type of word, its frequency, context, etc. Therefore, ChatGPT can make context-dependent and context-specific replies to queries (McGowan et al., 2023).

Due to its characteristics, there are many potential applications of ChatGPT in psychiatry. For instance, ChatGPT can be used to generate medical content (to save time and increase accuracy), to provide detailed drug-related information, to be a patient educator, or to generate summaries from medical records and put them in admission notes or discharge summaries (Çaliyurt, 2023; Cheng et al., 2023). Previous studies have shown ChatGPT may identify schizophrenia based on the initial three symptoms, provide a list of differential diagnoses and a list of assessment procedures, a list of medications, and a holistic management plan - including pharmacological and non-pharmacological approaches (Galido et al., 2023). It was also used to list therapeutic modalities for the treatment of alcohol-related disorders (Prada et al., 2023). It was less successful in recognizing women with birth-related PTSD from their narratives describing childbirth (at least in a zero-shot and few-shot learning; yet, with the embedding usage, the sensitivity and specificity increased to 85% and 75%, respectively; Bartal et al., 2023). It was the least successful in diagnosing personality disorders (Cheng et al., 2023).

Psychiatrists assessed the accuracy, completeness, and nuance of ChatGPT's answers to psychiatric questions as high (i.e., a composite score of 8.0 out of 10; Luykx et al., 2023). Furthermore, Luykx et al. (2023) showed that psychiatrists using ChatGPT scored higher when answering psychiatric questions compared to those using other sources of information.

Moreover, Nov et al. (2023) showed that lay subjects were willing to use ChatGPT for health advice, especially for logistical issues and preventative care; diagnostic and treatment advice had the lowest trust ratings. Furthermore, they were able to identify who wrote the answers (i.e., ChatGPT versus human-generated responses) only weakly (from 49 to 86% for different questions).

Other studies have shown ChatGPT can provide companionship, support, and therapy. For instance, there have been some positive results in reducing depression among college students and in patients with social anxiety disorder (Imran et al., 2023; Singh, 2023). At the moment, multiple healthcare systems are piloting the use of GPT-4 to draft responses to patients' messages (Singh et al., 2023).

However, we need to emphasize that ChatGPT was not trained only on medical data(Bartal et al., 2023; Nov et al., 2023). As it was trained on text from various sites, some of which are biased and not credible, it can provide wrong information and inappropriate advice (Ferdush et al., 2023; Singh, 2023; Singh et al., 2023; Wei et al., 2023). It can produce words or sentences that are semantically or syntactically plausible but incorrect or nonsensical (computer scientists call them hallucinations, although the more appropriate term is confabulations; Arbanas, 2024; Cheng et al., 2023; McGowan et al., 2023).

The aim of the present study was to determine what patients with different mental disorders think about the advantages and problems of ChatGPT when asking questions about their mental disorders and the medication they were using.

Method

Sample

We collected our data in October 2023 (1–31). All patients who came to the outpatient clinic to see any of the authors were asked if they had access to the internet. Those who answered positively were asked if they wanted to participate in a study aiming at determining the satisfaction of patients suffering from different mental disorders with the answers given by ChatGPT. Only patients with diagnosable mental disorders (having been diagnosed with a disorder from the F section in ICD-10) were included in the study. The study was done in the largest psychiatric centre in Croatia and one in Bosnia and Herzegovina. The ethical committee of the Croatian hospital approved the study. Patients were offered to either fill in a paper or an online form of a questionnaire.

Instruments

The questionnaire (created by the authors) consisted of two parts. The first part was about sociodemographic data: gender, age, marital status, education (elementary school – secondary school – bachelor's degree – master's degree), working status, socioeconomic status (Likert scale with five possible answers – much worse compared to an average family; worse;

not better, nor worse; better; much better), age of first contact with a psychiatrist, and prior use of ChatGPT.

The second part was about satisfaction with the information provided by the chatbot. Patients were advised to search for information about their disorder and medications on ChatGPT. They were then asked two questions: "What seems to you to be the biggest advantage of ChatGPT in regard to answering your questions about your mental disorder and medications you are using?" and "What seems to you to be the biggest disadvantage of ChatGPT in answering your questions?".

The questionnaire underwent content validation through an expert review. A panel of experts in psychiatry and computer science addressed the items for clarity, relevance, and comprehensiveness.

Procedure

Of 121 patients who visited the two psychiatric institutions as outpatients, had internet access, and were diagnosed with a mental disorder, 89 agreed to participate in our study. During the initial meeting, participants completed a sociodemographics-related questionnaire (described earlier) and were asked to list the reasons they typically use the internet. With this open-ended question, we wanted to minimize response bias and gather a more authentic reflection of their habits.

Subsequently, participants were asked if they had used ChatGPT before and, if so, for what purposes. After answering these preliminary questions, they were directly asked whether they had used ChatGPT to search for information about their mental disorder or the medications they were taking. This two-step questioning approach helped us assess the extent of engagement with AI tools while avoiding initial bias.

Participants were then instructed to use ChatGPT to inquire about their mental disorders and medications before the next meeting. They were informed that they could contact a psychiatrist (the authors of this manuscript) if they had any questions or concerns regarding the answers provided by ChatGPT. At the follow-up meeting, participants were asked to share the biggest advantages and disadvantages of using ChatGPT in relation to their inquiries.

Data analysis

Statistical analysis was conducted using SPSS version 26.0. Descriptive statistics, including means, standard deviations, and percentages, were used to summarize the sociodemographic data and the patterns of internet and ChatGPT usage.

Chi-square tests were employed to examine the association between categorical variables, such as gender and diagnosis, and the use of the internet and ChatGPT for health-related inquiries. For continuous variables, t-tests (for two groups) were utilized to determine if there were significant differences in the mean values among different groups (e.g., age groups, types of mental disorders).

Logistic regression analysis was performed to assess the impact of various factors (such as age, gender, diagnosis, and previous technology use) on the likelihood of using ChatGPT for mental health inquiries. The results were presented as odds ratios with 95% confidence intervals. The level of significance was set at $p < 0.05$ for all tests. This threshold was chosen to minimize the risk of Type I errors while acknowledging the exploratory nature of this study.

Thematic analysis was used to analyze qualitative data gathered through open-ended survey questions regarding the advantages and disadvantages of using ChatGPT. The analysis was conducted manually, following Braun and Clarke's (2006) six-step framework: familiarisation, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. To enhance reliability, three researchers independently coded the data and discussed discrepancies until a consensus was reached.

Results

The majority of participants were women, had average socioeconomic status, had either secondary education or college, and were not married/in a relationship (Table 1). Moreover, the majority of participants were diagnosed with 1. neurotic, stress-related, and somatoform disorders, 2. schizophrenia, schizotypal, and delusional disorders, and 3. mood/affective disorders (Table 2).

Table 1

Sample Description

	Total sample (N = 89)	Men (N = 35, 39%)	Women (N = 54, 61%)	
Age	40.1 ± 12.4	38.5 ± 12.9	41.1 ± 12.2	t = -0.947 p = 0.347
married/in a relationship	yes 30; no 59	yes 10; no 25	yes 20; no 34	χ^2 = 0.681 p = 0.409
employed	yes 60; no 29	yes 18; no 17	yes 42; no 12	χ^2 = 6.712 p = 0.010
socioeconomic status	below average 15 average 46 above average 28	below average 6 average 16 above average 13	below average 9 average 30 above average 15	χ^2 = 0.993 p = 0.609
education	primary 5 secondary 42 college 42	primary 4 secondary 23 college 8	primary 1 secondary 20 college 33	χ^2 = 13.827 p = 0.001

Table 2

Diagnoses of Participants

Section in ICD-10	Frequency	Percentage
F0 Organic, including symptomatic, mental disorders	3	3.8%
F1 Mental and behavioural disorders due to psychoactive substance use	3	3.8%
F2 Schizophrenia, schizotypal, and delusional disorders	25	31.3%
F3 Mood /affective/ disorders	17	21.3%
F4 Neurotic, stress-related and somatoform disorders	29	36.3%
F5 Behavioural syndromes associated with physiological disturbances and physical factors	1	1.3%
F6 Disorders of adult personality and behaviour	2	2.5%

The reasons for using the internet in our sample are presented in Table 3. Only three female participants claimed they used the internet for psychotherapy (one) and searching for health issues (two participants). There were no gender differences in reasons for using the Internet.

Table 3

Reasons for Using the Internet

Reason	Percentage of the sample
Reading news	43.8%
Social media and contact with people	29.2%
Music	16.9%
e-mails	14.6%
Movies	7.9%
Learning and studying	7.9%
Finding a job	5.6%
Playing games	5.6%
Amusement and fun	5.6%

Almost half of the sample (47.2%) had used ChatGPT prior to this study. The reasons for using ChatGPT are listed in Table 4. When directly asked if they have ever asked ChatGPT about their mental problems, 12.4% answered positively; 10.1% asked for advice about their mental health problem, and 7.9% asked about medications they were taking.

Table 4

Reasons for Using ChatGPT

Reason	Percentage of the sample
Job-related questions	7.9%
General questions, history	6.7%
Writing an essay, for university	5.6%
For fun	3.4%
Asking about health and physical illnesses	2.2%

Regarding the advantages and disadvantages of using ChatGPT, over 40% of participants listed availability as the main advantage (for all advantages, see Table 5). The main disadvantage was the lack of personal contact (for all disadvantages [as listed by participants], see Table 6).

Table 5

Advantages of ChatGPT

Advantage	Percentage of the sample
Instantaneous answers, availability	43.8%
Use from home	6.7%
Anonymity	5.6%
Information about medications	3.4%
Direct, precise answers	3.4%
Correct, high quality answers	3.4%
It is fun and interesting	3.4%

Table 6

The Main Disadvantages of ChatGPT

Disadvantage	Percentage of the sample
It is virtual, no personal contact, it is not alive, and has no emotions	22.5%
General, automated, vague answers	13.5%
It is complicated to log in	12.4%
Wrong answers	5.6%
It is not up-to-date	3.4%
You cannot talk to it	3.4%

Logistic regression analysis revealed no statistically significant associations between age, gender, diagnosis, or previous use of ChatGPT and the likelihood of using ChatGPT for mental health inquiries. The same was the case with the perceived main advantages or disadvantages of ChatGPT.

Discussion

A 2022 study from Croatia showed that 87% of those suffering from schizophrenia and depression used the internet, and 67% of those with psychosis and 71% of those with depression used the internet to search for information on mental health (Žaja et al., 2022). The participants in our study reported using the internet primarily for reading news and using social media. Only three women said they used it for psychotherapy and searching for health issues. One-third of the participants in our study were diagnosed with a psychotic disorder, and one-fifth with an affective disorder, so it is unclear why our results are so different from those of Žaja et al. (2022).

It is possible that many participants used it for health issues but did not mention it without a prompt (see also later in the text regarding the use of ChatGPT). Furthermore, it is interesting that our participants mainly used the internet for leisure activities and rarely for study or work. This might be due to their age profile. Previous studies have shown that the adult population uses the internet for various purposes, but mainly to stay connected with their families and friends. Moreover, people with mental health issues use it most often for social support (Brunette et al., 2017; Li et al., 2024).

ChatGPT was launched in November 2022; over the following year, it permeated many areas of human life, including medicine. Almost half of our participants, patients with mental disorders, have used ChatGPT before participating in our study. This high percentage of patients using modern technologies is not surprising, as described earlier in the text. As shown in Table 4, people use ChatGPT for very different reasons, none of which is dominant. Only 2% said they used it for health-related issues; however, when asked directly, 12% confirmed they did use it to ask questions about their mental disorder or medication. This discrepancy suggests that more specific inquiry can prompt recollection of otherwise overlooked instances of ChatGPT usage – a phenomenon consistent with research on memory retrieval and cue specificity. In the current study, participants may have underreported health-related internet activity until specifically prompted, underscoring how the phrasing and specificity of questions can influence self-report. Given the abundance of evidence that individuals with mental disorders can experience difficulties with memory, attention, or insight, structured, specific questioning may be especially critical to capture

accurate usage patterns in psychiatric populations. Future studies would benefit from employing multi-stage or more detailed questioning in order to mitigate recall bias, especially among populations that may have cognitive vulnerabilities. Additionally, researchers might consider direct observational or usage-log methods to further clarify the extent to which ChatGPT is sought out for mental health information.

Almost half of the sample (44%) reported that the main positive characteristic of ChatGPT is that it produces immediate answers and is available at any time, from home. Such findings align with earlier research and expert opinions. Singh, in his article on opportunities and challenges of ChatGPT in mental health care, as well as Imran and colleagues (writing about the same topic in child psychiatry), suggest that the main asset of ChatGPT is that it can provide companionship at any time and is available 24/7, including in crises (Çaliurt, 2023; Imran et al., 2023). Our patients recognized all-time availability as a valuable characteristic of ChatGPT, noting that "you can talk with ChatGPT at any time, whenever you like," "you do not need to schedule an appointment with it, contrary to making appointments with your doctor," and "you can continue a discussion with it as long as you wish, whereas appointments with psychiatrists are time-limited." In this regard, in the future, ChatGPT or other chatbots might help solve the problem of an insufficient number of mental health professionals, especially in child and adolescent psychiatry, since children and adolescents are even more open to using chatbots, compared to adults (Amram et al., 2023; Singh, 2023; Van Dellen, 2023).

Whereas several authors stated that some patients might be concerned about their therapist judging them and being unwilling to talk to a therapist about sensitive issues or sharing confidential information, patients from our sample did not list this as one of advantages of the ChatGPT (Imran et al., 2023; Van Dellen, 2023; Ventriglio & Ricci, 2023; Wei et al., 2023).

The main disadvantage, according to our patients, was that ChatGPT is not a real human being, has no emotions, and cannot provide contact. Some previous studies (i.e., Skjuve et al., 2021) showed that people can develop a human-chatbot relationship and that, with additional prompts and in a trained version of ChatGPT, ChatGPT can maintain the conversation in a positive way and provide a non-judgmental and supportive presence for the

patient (at least psychiatrists assessed it that way). However, our data seems to suggest that actual patients do not share this optimistic view of the chatbot's abilities (Eshghie & Eshghie, 2023). Although ChatGPT and other chatbots can give precise and accurate responses and follow professional guidelines, patients need something more – support, empathy, and an actual relationship with another human being. Studies on therapeutic factors in psychotherapies have shown that non-specific factors (i.e., factors not related to a specific psychotherapeutic technique), such as therapeutic alliance, therapist's warmth and competence, may have a very important role in predicting therapeutic outcomes (Chatoor & Krupnick, 2001; Seewald & Rief, 2023). It is possible that in the future, by attaching friendly avatars and combining language analysis with physiological measurements achieved by wearable devices, we might produce better results, as Pohl described in his science fiction novel forty years ago (Cheng et al., 2023; Pohl, 2006).

Furthermore, although professionals assessed ChatGPT as a source of accurate information based on professional guidelines with the composite score (of accuracy, completeness and nuance) of 8.0 out of 10, our participants assessed the answers to be general, automated, and vague (Galido et al., 2023; Moise et al., 2023; Prada et al., 2023). Interestingly, although the majority of our patients were familiar with the use of the internet, they found the log-in process to be technically complicated and difficult to solve.

To our knowledge, this is the first study of patients with mental disorders to assess the positive and negative aspects of ChatGPT's replies to their queries about mental disorders. Previous studies assessed the experiences of professionals and the general population, but not patients with diagnosed mental disorders.

The main limitation of the study is its small sample size. A study using a larger sample could examine whether there are any differences in experiences with ChatGPT between people with different mental disorders (especially those that were not represented with a large enough sample here to run statistical analyses). Also, our results cannot be generalized to people with mental disorders in other regions and countries.

Conflict of interest

We have no conflicts of interest to disclose.

Data availability statement

Data used in this paper are available upon a reasonable request.

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Research Article

Peer-perceived popularity and different forms and functions of aggression in Croatian emerging adult women

Marija Šarić Drnas [1] ✉, Paula Pedić-Duić [1]

[1] *Faculty of Teacher Education, University of Zagreb, Zagreb, Croatia*

ABSTRACT

This study examines the associations between peer-perceived popularity and aggression in emerging adult women. The sample included 155 education students from the Faculty of Teacher Education, University of Zagreb (M_{age} = 20.5 years). Students were asked to nominate their fellow students whom they perceived as popular and unpopular to assess peer-perceived popularity. The different forms and functions of aggression were measured with the Peer Conflict Scale. The results supported the prediction that peer-perceived popularity among emerging adult women plays a more significant role in proactive compared to reactive aggression. In addition to the linear associations, a curvilinear trend also emerged, indicating that proactive overt aggression is associated with peer-perceived popularity and unpopularity in emerging adult women. The relationship between peer-perceived popularity and reactive types of aggression is more complex, suggesting that the dynamics between popularity and aggression among emerging adult women warrant further research.

Keywords: peer-perceived popularity, proactive overt aggression, reactive overt aggression, proactive relational aggression, reactive relational aggression

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✉ Corresponding author's email: marija.saric@ufzg.hr

Introduction

Youth aggression is a global public health issue (Ferris, 2002). Therefore, understanding the underlying causes of aggressive behavior is important for developing effective prevention programs (Liu et al., 2013). One factor predicting aggressive behavior in young people is peer-perceived popularity, with research indicating that both popular and unpopular young people can exhibit aggression (Prinstein & Cillessen, 2003). However, there is limited research that analyzed the role of peer-perceived popularity in the occurrence of different forms of aggression (overt and relational) and functions of aggression (proactive and reactive), especially in the period of emerging adulthood (Stolz et al., 2016). Given that female aggression is often under-researched (Denson et al., 2018), this study aimed to determine the role of peer-perceived popularity in the occurrence of aggression of different forms and functions among emerging adult women.

Peer-perceived popularity and aggression

Human social interactions evolve from simple peer play to deeper engagement in complex social groups (Guyer & Jarcho, 2018). An important aspect of peer relationships is peer status. Peer status is associated with social functioning throughout childhood and adolescence, but much less is known about its long-term implications. A developmental phase that follows adolescence (i.e., emerging adulthood) is marked by significant diversity in social and contextual environments as well as in educational and occupational paths. As individuals' social contexts and relationships evolve, the factors associated with high status within peer groups may also shift, reflecting changes in social hierarchies and valued traits (Arnett, 2000).

The literature on peer relationships is mostly based on research conducted on children and adolescents (Chmielowice-Szymanski et al., 2024). Accordingly, peer social status has been studied as a risk factor for developing aggressive behavior, with significant evidence linking low social status among peers with social incompetence and aggressive behavior (Prinstein & Cillessen, 2003). However, adolescence is marked by the emergence of a unique form of peer status, known as peer-perceived popularity, which differs from sociometric popularity (van den Berg et al., 2020). Sociometric popularity measures how well-liked an individual is by

their peers and is generally negatively correlated with aggression (Prinstein & Cillessen, 2003; Yavuzer, 2013). In contrast, peer-perceived popularity reflects social status within a peer group, including an individual's visibility, influence, and prestige, and it is consistently found to have a positive relationship with aggression (Vaillancourt & Hymel, 2006). Peer-perceived popularity is examined through peer nominations, identifying those perceived as the most and least popular. Thus, peer-perceived popularity reflects an individual's reputation and is based on a collective agreement within the peer group regarding who is considered the most popular (Cillessen & Marks, 2011). Adolescents who are perceived as popular exhibit a complex behavioral profile that includes both positive and negative traits. They often possess qualities valued by their peers, such as attractiveness and academic success. However, some individuals who are perceived as popular may engage in social manipulation, coercion, and aggression to maintain or enhance their status (Cillessen & van den Berg, 2012). These individuals may purposely behave in ways that harm others to control their social environment and sustain or display their perceived popularity.

Understanding the manifestation of popularity across developmental stages is important, as it is closely linked to social functioning and mental health (Prinstein & Giletta, 2016). However, much less is known about peer-perceived popularity and related outcomes, such as aggression in emerging adults (Chmielowice-Szymanski et al., 2024). Some studies suggest that peer-perceived popularity may pose a lower risk for aggression in emerging adulthood compared to adolescence, likely due to a normative increase in maturity as individuals transition into emerging adulthood and develop traits and behaviors that foster social cohesion (Lansu et al., 2023; Ruschoff et al., 2015). However, studies suggest that aggressive behavior does not completely lose its role in emerging adult peer status, continuing to be an important factor in the behavioral correlates of popular individuals (Ruschoff et al., 2015). For example, Lansu and Cillessen (2012) have shown that peer-perceived popularity among emerging adults was linked to being both prosocial and aggressive, suggesting that popular emerging adults may use aggression to maintain their social status. Thus, studies show that both low and high levels of peer-perceived popularity present a risk factor for aggression. To understand how these relations occur, it is suggested that different forms and functions of aggression be examined (Stolz, 2016).

Peer-perceived popularity and forms of aggression

The literature differentiates between two primary forms of aggression: relational aggression, which involves harming others through the exploitation of social relationships, and overt aggression, characterized by direct verbal or physical harm (Andreou, 2006). Forms of aggression are differentially related to peer-perceived popularity. There are several reasons to believe that popular individuals would profit more from relational aggression than from overt aggression. For instance, relational aggression is a subtler and more "sophisticated" form of harm, allowing the perpetrator to remain unidentified and avoid allegations of aggression. This furtive nature helps maintain the aggressor's social standing without attracting negative attention (Andreou, 2006). Secondly, relational aggression is linked to a higher ability to perceive and interpret social cues accurately (Pellegrini & Roseth, 2006), and this skill is important for maintaining power and influence within social structures. Accordingly, research consistently indicates that peer-perceived popularity is positively correlated with relational aggression (Casper et al., 2020; Lu et al., 2018).

On the other hand, findings on the relationship between peer-perceived popularity and overt aggression are more inconsistent. Overtly aggressive behavior carries a higher risk to an individual's social status, as it is more conspicuous and may be perceived negatively, potentially leading to unfavorable peer evaluations. Accordingly, some studies suggest a negative association between peer-perceived popularity and overt aggression (Andreou, 2006; Cillessen & Mayeux, 2004). Conversely, overt aggression can also enhance peer status, as it may be interpreted as a sign of dominance (Cillessen & Rose, 2005). Indeed, certain studies indicate that peer-perceived popularity positively predicts overt aggression (Lu et al., 2018; Walcott et al., 2008).

Peer-perceived popularity and functions of aggression

Aggression can be understood based on the motivation of the perpetrator, yielding to the dichotomy of reactive and proactive aggression (Tuvblad et al., 2009). Reactive aggression is a violent response to a real or perceived threat, predicted by a hostile attribution bias (Quan et al., 2022). It is explained by the frustration-aggression hypothesis (Berkowitz, 1989),

according to which aggression is a hostile reaction to frustration and is associated with fear, anxiety, and difficulties in emotional regulation (Vitaro et al., 2002). In contrast, proactive aggression is rather deliberate and goal-oriented behavior aimed at achieving specific outcomes. Proactive aggression is explained by social learning theory, which posits that aggression is a learned instrumental behavior reinforced by rewards (Vitaro et al., 2002).

The definitions of proactive and reactive aggression suggest unique associations with peer-perceived popularity among adolescents. It is plausible to expect that popular adolescents engage more in proactive aggression due to its strategic and goal-oriented nature. Adolescents perceived as popular adolescents may be driven to maintain their dominance and status by using proactive aggression to control peers, thus securing power and influence within their social groups. This type of aggression is often associated with attempts to preserve a dominant social position they feel belongs to them (Prinstein & Cillessen, 2003). Studies have shown that peers frequently link peer-perceived popularity with proactive aggression, and the perceived rewards of this behavior may further reinforce its use (Prinstein & Cillessen, 2003). Proactive aggression, being instrumental and strategic, may also be connected to a certain level of social skills. This includes the ability to minimize the negative consequences of aggressive acts, aligning with the behavioral profiles of popular adolescents (Stolz et al., 2016). On the other hand, peer-perceived popular adolescents are less likely to display reactive aggression. This type of aggression is often seen as a dysregulated and uncontrolled form of expressing discontent (Fite et al., 2016). As a result, reactive aggression is more common among unpopular adolescents (Stolz et al., 2016). Reactive aggression is associated with a lack of social skills and less socially competent behavior (McAuliffe et al., 2007), which are characteristics frequently observed in unpopular adolescents.

However, previous studies exploring the relationship between peer-perceived popularity and aggression have often focused on either general aggression or specific measures of the form or function of aggression. To address the interplay between different forms and functions of aggression, this research uses a multidimensional approach that considers both the form and function of aggression. More specifically, it differentiates between

proactive overt aggression, proactive relational aggression, reactive overt aggression, and reactive relational aggression (Kempes et al., 2005).

An important aspect to consider in the relationship between peer-perceived popularity and aggression are gender differences. Compared to our understanding of male aggression, our knowledge of female aggression remains limited (Denson et al., 2018). Therefore, this study aims to address this gap by examining the role of peer-perceived popularity in the occurrence of different forms and functions of aggression among emerging adult women.

Gender prototypicality theory posits that popularity is attributed to individuals who align with gender-typical roles in both appearance and behavior (Mayeux & Kleiser, 2020). Adhering to gender norms prescribed by societal conventions may play a critical role in the development of social power. Attributes commonly associated with popularity, such as attractiveness and kindness in the case of girls, are closely aligned with traditional gender norms. Thus, those who deviate from these norms are more likely to be rejected by peers.

Since women choose relational aggression over overt aggression, relational aggression is sometimes called “female aggression” (McAndrew, 2014). Following gender prototypicality theory, studies consistently show that peer-perceived popularity positively predicts relational aggression among girls (Rose et al., 2004; Salmivalli et al., 2000). On the other hand, overtly aggressive girls may have problems with their psychosocial adjustment because these behaviors deviate from traditional gender norms (Murphy, 2008). However, research on the relationship between peer-perceived popularity and overt aggression among girls has given mixed results. Some studies suggest a positive correlation, indicating that some popular girls are overtly aggressive (de Bruyn et al., 2010; Lease et al., 2002). However, other studies did not find this relationship (Andreou, 2006; Rose et al., 2004). This indicates that not all overtly aggressive girls are socially marginalized; some are integrated into social groups and are perceived as *cool* or leaders (Estell et al., 2008).

To the best of our knowledge, only one previous study (Prinstein & Cillessen, 2003) has investigated the relationship between peer status and aggression of different forms and functions. Their findings indicate that girls' proactive aggression, regardless of its form, is associated with high peer-

perceived popularity. In contrast, the relationship between girls' reactive aggression and perceived popularity varies by form, with high levels of reactive overt aggression associated with low popularity and high levels of reactive relational aggression associated with high popularity. Some studies (Marsee et al., 2011; Šarić Drnas, 2020) show that girls manifest a higher level of reactive relational aggression than boys. Results from these studies suggest that reactive relational aggression may be a gender-normative type of aggression, so it makes it easier for women to maintain or enhance their peer status since gender-normative types of aggression are related to better peer status (Kochel et al., 2012; Zimmer et al., 2005).

In addition to linear effects where popular individuals may engage in aggressive behavior strategically to maintain their position in a group, Prinstein and Cillessen (2003) have suggested that unpopular individuals may also use the same types of aggressive behavior. However, unpopular individuals may be less effective at using aggressive strategies to enhance their social status. This pattern of findings is reflected in a subtle, curvilinear trend in which aggressive behavior is predominantly associated with high peer-perceived popularity but also significantly associated with low peer-perceived popularity. While linear models are limited by describing only a single predicted association, the examination of curvilinear trends allows for a systematic study of the heterogeneity of adolescents who may behave aggressively, suggesting that such behavior may be associated with various points along the status continuum.

Given that proactive and relational aggression are seen as an effective way of enhancing and maintaining one's high status (Gangel et al., 2017; Stolz et al., 2016), it was hypothesized that proactive overt, proactive relational, and reactive relational aggression would follow a curvilinear trend, with both popular and unpopular young women engaging more in these behaviors. In contrast, reactive overt aggression, typically driven by frustration or perceived threats (Meidenbauer et al., 2024), was expected to be more prevalent among unpopular young women due to heightened social stress and exclusion. Since popular individuals tend to have better social and emotional regulation skills (Niven et al., 2015), they were expected to exhibit lower levels of reactive overt aggression, leading to a linear rather than a curvilinear pattern.

The Current Study

The main goal of this study was to expand existing knowledge about the relationship between peer-perceived popularity and aggression among emerging adult women. Peer-perceived popularity has not been sufficiently examined as a risk factor for the occurrence of different forms and functions of aggression. Thus, the first goal of this study was to explore how peer-perceived popularity predicts different forms and functions of aggression among emerging adult women. Since peer-perceived popularity is suggested to be a risk factor for proactive types, unlike reactive types of aggression, it was hypothesized that peer-perceived popularity among emerging adult women would play a more substantial role in proactive types compared to reactive types of aggression (H1a). Moreover, it was hypothesized that peer-perceived popularity would positively predict both proactive overt aggression (H1b) and proactive relational aggression among women (H1c). Regarding reactive types of aggression, it was hypothesized that peer-perceived popularity would predict high reactive relational aggression (H2a) and low reactive overt aggression among young women (H2b) (Marsee & Frick, 2007).

The second goal of this study was to verify the existence of curvilinear associations between peer-perceived popularity and different forms and functions of aggression among emerging adult women. Thus, we assume that both popular and unpopular young women would engage in proactive overt aggression (H3a), proactive relational aggression (H3b), and reactive relational aggression (H3c). However, we do not expect a curvilinear association between peer-perceived popularity and reactive overt aggression (H3d).

This study controlled for age, material status (MS), and academic achievement to isolate the effect of perceived popularity on aggression. Although the sample was narrowly focused on emerging adult women, age remains relevant as older individuals in this stage face heightened pressures in work, relationships, and identity, which may amplify aggression (Arnett, 2000). MS may influence aggression through resource access and stress, with lower MS potentially linked with higher aggression (Greitemeyer & Sagioglou, 2016). Academic achievement may affect frustration and coping skills, with lower performance potentially associated with increased aggression (Savage et al., 2017).

Method

Participants and procedure

The study involved 155 emerging adult women (*M* = 20.5, *SD* = 1.8, age range = 18–28), all primary education students at the Faculty of Teacher Education, University of Zagreb. Most participants (85%) rated their material status as average. Participants generally had high academic achievement (see Table 1 for details). The participants were organized into eight seminar groups, each consisting of approximately 25 students, attending classes together throughout the academic year. Male students (<10% of the cohort) were excluded due to limited gender variability and research focus. Recruitment occurred one week before data collection. Eligible female students gave verbal consent for inclusion in peer nomination lists. On data collection day, participants provided written informed consent and completed paper-pencil questionnaires in a controlled classroom setting, ensuring privacy and confidentiality. Data were pseudonymized. The study was conducted by faculty members, with ethical safeguards in place to prevent conflicts of interest. Participation was voluntary, with assurances that non-participation would not affect academic evaluation. The research protocol adhered to ethical standards and was approved by the Ethics Committee of the Faculty of Teacher Education, University of Zagreb. Data collection occurred during the summer semester of the 2023/2024 academic year.

Measures

Peer-perceived popularity

Participants nominated peers from their seminar group as the "most" and "least" popular by marking an “x” on a questionnaire listing all recruited students from their group. They could nominate any number of same-sex fellow students (at least one) but not themselves. Nominations were standardized within seminar groups, and a popularity score was calculated as the difference between standardized scores for the most and least popular students. This was further standardized within seminar groups, following Parkhurst & Hopmeyer (1998) and Stoltz et al. (2016). This two-

step standardization ensures comparability within seminar groups but may cause slight deviations from a mean of 0 across groups due to variations in size, distribution, or rounding. Nominations were made within seminar groups rather than by academic year, reflecting the structured seminar system in Croatian universities, where students interact with the same peers throughout the day and semester.

Aggression

Participants were asked to nominate peers from their seminar group whom they believed: 1) threatened others when they did something wrong; 2) were deliberately cruel to others, even if they had not done anything to them; 3) spread rumors and lies about others to get what they wanted; and 4) stole friends from those that made them angry. The first question assessed peer-perceived reactive overt aggression, the second proactive overt aggression, the third proactive relational aggression, and the fourth reactive relational aggression. These items were derived from the Peer Conflict Scale (Marsee & Frick, 2007). Specifically, for each combination of form and function of aggression, the item with a high factor loading, as identified in the validation of the Peer Conflict Scale on a Croatian sample (Šarić Drnas et al., 2020) was used. The response method for the questionnaires was the same as for the popularity nominations, with participants putting an "x" next to the names on their questionnaires. Each questionnaire included the names of recruited students within that seminar group for these questions. Participants could nominate any number of same-sex fellow students, with a minimum suggestion of one nomination, and were not allowed to nominate themselves. Nominations for these categories were standardized within each seminar group. Participants were not compelled to respond to questions and were assured they could discontinue their participation at any time, adhering to the ethical guidelines for sociometric research (Guideline 2, Bell-Dolan & Wessler, 1994). If students expressed uncertainty about whom to nominate, we provided additional verbal clarification about the question's intent and ensured the anonymity of their responses.

Academic achievement

Academic achievement was measured using three indicators: (1) average grades, (2) number of exams passed, and (3) ECTS credits. To enable

aggregation, the scores for each indicator were rescaled to a common scale ranging from 1 (the lowest value) to 5 (the highest value). The rescaled values were then averaged to calculate a composite academic achievement score. Exploratory factor analysis (EFA) confirmed that these measures loaded onto a single latent factor, justifying their aggregation into a composite academic achievement score. All assumptions for EFA were met (Table A in Supplementary Materials). This method aligns with prior research (e.g., Rubić, 2021), supporting the validity of using multiple indicators to assess academic success.

Material status

Material status was assessed using a single-item measure where participants were asked to rate their material status on a five-point Likert scale (1 = *significantly below average*, 2 = *below average*, 3 = *average*, 4 = *above average*, 5 = *significantly above average*).

Data analyses

Descriptive statistics were computed for peer-perceived popularity, the four types of aggression, age, material status, and academic achievement. The results are summarized in Table 1. To test the research hypotheses, four separate hierarchical regression analyses were conducted for proactive overt, proactive relational, reactive overt, and reactive relational aggression. All analyses were conducted in *R* (R Core Team, 2023). Regression assumptions were tested before conducting the analysis (Flatt & Jacobs, 2019). No multicollinearity issues were found, and the Durbin-Watson test indicated no significant autocorrelation. However, tests revealed heteroscedasticity and deviations from normality. To address non-normality in the residuals, winsorization was applied to the peer-perceived popularity variable. This technique mitigates the influence of extreme values by replacing outliers beyond the 5th and 95th percentiles with the nearest values within these thresholds. This approach preserves the overall data distribution and normalizes the residuals, ensuring the integrity of the linear regression assumptions without altering the scale of the variables (Pek et al., 2018). Additionally, HC1 robust standard errors were employed to correct for heteroscedasticity. As prior research indicated that age, material status, and

academic achievement may affect aggression, these variables were controlled for in Step 1. In Step 2, peer-perceived popularity was introduced. Given the expectation of curvilinear trends indicating that both high and low status predict aggression, a quadratic term for popularity was included in Step 3. The results are presented in Tables 2-5.

Results

Descriptive statistics

As shown in Table 1, all types of aggression were strongly positively correlated, following the effect size benchmarks of Lovakov and Agadullina (2021). Peer-perceived popularity showed a small to moderate correlation with proactive types of aggression but was not significantly related to reactive types of aggression. Students' age showed moderate correlations with proactive types of aggression, as well as reactive overt aggression, but was not significantly related to reactive relational aggression. Additionally, students' age showed weak positive correlations with academic achievement and no significant correlation with either material status or popularity. Material status showed no significant correlations with aggression or popularity. Academic achievement was negatively correlated with reactive relational aggression, with an effect size classified as small to moderate, and had a small positive correlation with proactive relational aggression; no significant associations were found with overt aggression.

All aggression variables were positively skewed; however, following Kline's (2011) guidelines, they still met acceptable normality thresholds. Moreover, descriptive statistics suggest that relative to other types, reactive overt aggression showed the highest prominence, while proactive relational aggression was the least characteristic in this sample.

Table 1

*Pearson Correlation Coefficients and Descriptive Parameters (*N=*155)*

	1.	2.	3.	4.	5.	6.	7.	*M*	*SD*	*S*	*K*
1. Popularity	-							-.28	1.15	-1.66	7.52
2. Proactive overt aggression	.22**	-						-.34	1.12	2.34	5.68
3. Reactive overt aggression	.13	.79**	-					-.33	1.14	2.02	3.7
4. Proactive relational aggression	.16**	.65**	.66**	-				-.63	1.32	0.78	1.33
5. Reactive relational aggression	.07	.58**	.59**	.71**	-			-.45	1.41	1.78	4.73
6. Age	.08	.27**	.33**	.32**	.09	-		20.45	1.82	2.33	10.76
7. MS	.08	-.11	-.05	-.07	.00	-.13	-	-	-	-	-
8. Academic achievement	-.04	-.10	-.11	.17*	-.23**	.21**	-.03	4.24	.84	-1.39	0.71

Note. S- skewness; K-kurtosis; All correlations are Pearson's r, except those involving material status (MS), for which Spearman's rho was used due to the ordinal nature of the variable; ** $p < .01$.

Examining the linear and curvilinear relationship between peer-perceived popularity and proactive types of aggression

Tables 2 and 3 present the regression models predicting proactive types of aggression. Age positively predicted both proactive overt and relational aggression, while academic achievement showed a negative effect. MS was not a significant predictor. Peer-perceived popularity significantly predicted both proactive types of aggression, though effect sizes were small (Cohen, 1998). A curvilinear (inverse J-shaped) relationship was found for proactive overt aggression (Figure 1), but no quadratic effect emerged for relational aggression. The models explained 18% of the variance in proactive overt aggression and 20% in proactive relational aggression, highlighting the modest yet significant predictive role of sociodemographic factors and peer-perceived popularity.

Table 2

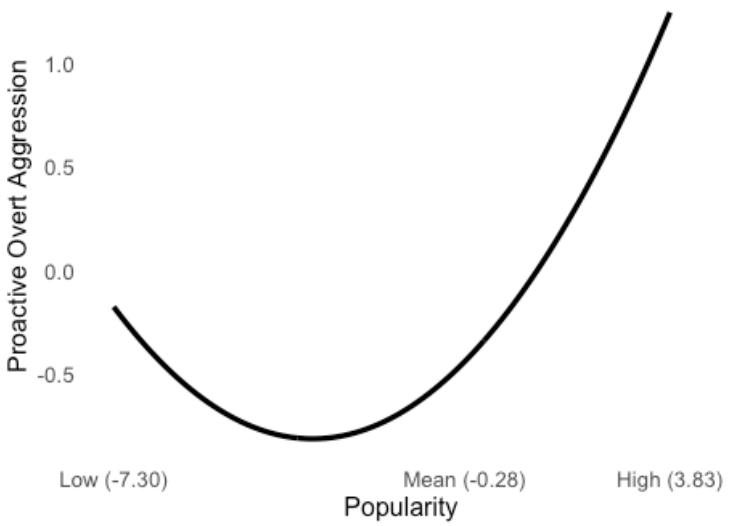
Associations Between Peer-Perceived Popularity and Proactive Overt Aggression

Predictors	Step 1 (β)	Step 2 (β)	Step 3 (β)
1. Sociodemographics			
Age	.21**	.20**	.18**
MS	.12	.13	.09
Academic achievement	-.17**	-.22**	-.27**
2. Popularity		.16**	.22**
3. Popularity*Popularity			.05**
ΔR^2		.05**	.03**
R^2	.10**	.15**	.18**

Note. ** $p < .01$

Figure 1

Curvilinear Association Between Peer-Perceived Popularity and Proactive Overt Aggression



Note. The plotted line represents predicted values from a quadratic regression model.

Table 3

Associations Between Peer-Perceived Popularity and Proactive Relational Aggression

Predictors	Step 1 (β)	Step 2 (β)	Step 3 (β)
1. Sociodemographics			
Age	.25**	.23**	.23**
MS	-.09	-.08	-.12
Academic achievement	-.36**	-.35**	-.34**
2. Popularity		.14**	.20**
3. Popularity*Popularity			.03
ΔR^2		.04*	.01
R^2	.15**	.19**	.20**

Note. * $p < .05$. ** $p < .01$

Examining the linear and curvilinear relationship between peer-perceived popularity and reactive types of aggression

Tables 4 and 5 summarize the regression models predicting reactive types of aggression. Age significantly predicted reactive overt aggression but was not a significant predictor of reactive relational aggression. Academic achievement was negatively associated with both reactive types of aggression, while material status (MS) was not a significant predictor. Peer-perceived popularity positively predicted reactive overt aggression, although the effect size was small (Cohen, 1998) and was not a significant predictor of reactive relational aggression. No significant curvilinear effects were found. The models accounted for 18% of the variance in reactive overt aggression and 9% in reactive relational aggression, demonstrating the relevance of these predictors while also indicating the potential influence of additional factors.

Table 4

Associations Between Peer-Perceived Popularity and Reactive Overt Aggression

Predictors	Step 1 (β)	Step 2 (β)	Step 3 (β)
1. Sociodemographics			
Age	.23**	.22**	.21**
MS	.06	.06	.06
Academic achievement	-.33**	-.32**	-.32**
2. Popularity		.14**	.16**
3. Popularity*Popularity			.03
ΔR^2		.03*	.01
R^2	.14**	.17**	.18**

Note. * $p < .05$. ** $p < .01$

Table 5

Associations Between Peer-Perceived Popularity and Reactive Relational Aggression

Predictors	Step 1 (β)	Step 2 (β)	Step 3 (β)
1. Sociodemographics			
Age	.08	.08	.08
MS	.04	.04	.02
Academic achievement	-.33**	-.32**	-.32**
2. Popularity		.06	.09
3. Popularity*Popularity			.01
ΔR^2		.01	.00
R^2	.08*	.09*	.09*

Note. * $p < .05$. ** $p < .01$

Discussion

The present study examined the association between peer-perceived popularity and different forms and functions of aggression among emerging adult women. The findings from the correlation and hierarchical regression analyses (Tables 1–5) suggest that peer-perceived popularity is more strongly associated with proactive than reactive types of aggression among young women, which is consistent with prior studies on children and adolescents (e.g., Prinstein & Cillessen, 2003). Peer-perceived popularity was a significant predictor of both proactive overt and proactive relational aggression, supporting the first hypothesis. These findings indicate that popular young women may use proactive aggression as a strategic behavior aimed at maintaining their social status. However, the increase in explained variance was small (Tables 2-3), indicating that while statistically significant, peer-perceived popularity contributed only modestly to the prediction of proactive types of aggression.

Further, peer-perceived popularity explains the largest proportion of variance in proactive overt aggression (larger than in other types of aggression), though this influence represents a small effect (Cohen, 1988). Although gender differences in different forms and functions of aggression have not been sufficiently examined, one emerging adult study (Bailey & Ostrov, 2008) has shown that men achieve higher scores on proactive overt aggression than women, which is consistent with studies carried out on adolescents (Marsee et al., 2011; Šarić, 2017). Thus, although proactive overt aggression may not be a gender-normative type of aggression for women, it still has the strongest relation with peer-perceived popularity, which is not in line with previous studies relating gender non-normative types of aggression with lower peer status (Kochel et al., 2012). However, few studies have examined the normative types of aggression in emerging adulthood. For example, Nelson et al. (2008) conducted a content analysis of students' perceptions of aggression in emerging adulthood. Their findings indicate that latency is not always a characteristic of female aggression in emerging adulthood because women may also overtly aggress if the social situation justifies or allows it. The study of Nelson et al. (2008) found that when women display overt aggression, they tend to use its verbal way rather than its physical form. Thus, according to Nelson et al. (2008), we suggest

that, in future research, proactive overt aggression is disentangled into proactive use of verbal and proactive use of physical aggression so that their independent relationships with popularity among women could be examined. The observed linear relationship between peer-perceived popularity and proactive relational aggression (Table 3) can be understood as proactive and relational aggression are typically associated with high perceived popularity (Gangel et al., 2017; Prinstein & Cillessen, 2003). Proactive aggression often manifests in a hidden, relational form rather than an overt form (Kempes et al., 2005) because it relies on social skills. Both proactive and relational aggression are positively related to social skills (Andreou, 2006; McAuliffe et al., 2007). Thus, proactively aggressive individuals may prefer relational aggression as a subtle way to achieve their goals without risking unpopularity.

Regarding relations between peer-perceived popularity and reactive types of aggression, it was hypothesized that women perceived as popular would engage in reactive relational aggression. However, the impact of perceived popularity on reactive relational aggression was not significant. On the other hand, it was assumed that peer-perceived popularity would predict lower levels of reactive overt aggression. However, this hypothesis was not confirmed. Instead, peer-perceived popularity positively predicted reactive overt aggression, although the effect size was small. Moreover, the additional variance explained in this step was minimal (Table 4), indicating a limited contribution of peer-perceived popularity to the overall prediction of reactive aggression.

As previously mentioned, studies regarding gender differences in different forms and functions of aggression are scarce. However, they show that reactive overt aggression is typically more prominent in men (Bailey & Ostrov, 2008) and adolescent boys (Marsee et al., 2011; Šarić, 2017). Although reactive overt aggression may not be typically associated with women, our study found a significant positive relation with perceived popularity, contradicting earlier studies that linked gender non-normative aggression with lower peer status (Kochel et al., 2012). The results from this study reveal a complex and inconsistent relationship between female overt aggression and peer-perceived popularity, aligning with findings from previous developmental periods (Andreou, 2006; de Bruyn et al., 2010).

Building on the findings of Nelson et al. (2008), future studies should separate overt aggression into verbal and physical aggression and examine the relationships between these two forms of aggression and peer-perceived popularity among women. Unlike physical aggression, verbal aggression may be a more effective strategy for women to maintain their dominance and popularity, although this hypothesis has yet to be examined. The second goal of this study was to verify the existence of curvilinear associations between peer-perceived popularity and different forms and functions of aggression in emerging adult women. We assumed that both popular and unpopular young women would engage in proactive overt, proactive relational, and reactive relational aggression and that no curvilinear association would be found for reactive overt aggression.

The results presented in Table 2 indicate a curvilinear association between peer-perceived popularity and proactive overt aggression, showing that both low- and high-popular emerging adult women exhibit higher levels of this behavior (Figure 1), consistent with the hypothesis and previous research (Prinstein & Cillessen, 2003; Stolz et al., 2016). Among popular women, it may serve to maintain status, while among less popular women, it may reflect attempts to gain social visibility, though often unsuccessfully. Further, contrary to expectations, no curvilinear associations were found for proactive relational and reactive relational aggression. Following the hypothesis, no curvilinear trend was observed for reactive overt aggression. The absence of a curvilinear trend in relational aggression may be due to the limitations of the peer nomination method (Mehari et al., 2019). While overt aggression is highly visible, relational aggression is more covert, making it harder for peers to recall and nominate moderate aggressors. Since nominations require selecting a limited number of peers, they may have disproportionately identified highly visible aggressors while underrepresenting subtler cases, potentially obscuring the expected curvilinear trend.

Finally, although peer-perceived popularity significantly predicted some types of aggression, its contribution was modest compared to sociodemographic factors, particularly academic achievement. Academic achievement was consistently negatively associated with all types of aggression (Tables 2–5), with the strongest effects observed for proactive

and reactive relational aggression. This aligns with meta-analytic findings by Savage et al. (2017), demonstrating a robust inverse relationship between academic achievement and aggression. Savage and Wozniak (2016) suggest that this association may be explained by cognitive deficits linked to lower academic performance, including impaired problem-solving and executive functioning, which increase reliance on aggression. Additionally, academic struggles can contribute to frustration, negative emotionality, and school disengagement, further predisposing individuals to aggressive behaviors. Age positively predicted all types of aggression except for reactive relational aggression (Tables 2–5). This suggests that as emerging adult women mature, they may be more likely to engage in proactive and reactive overt aggression, as well as proactive relational aggression. The lack of a significant association with reactive relational aggression may indicate that this type of aggression remains more stable across emerging adulthood or is influenced by other factors beyond age. Unlike academic achievement and age, material status was not a significant predictor of aggression in any analyses (Tables 2–5). One possible explanation for the non-significant role of material status in this study is the relatively low variability within the sample, as the majority of participants (85%) reported an average financial standing.

There are several limitations to this study: first, the sample consisted only of emerging adult women attending a single university and a single academic program, which greatly reduced the sample's diversity and generalizability of our findings. Thus, future research should include students from various university programs and academic years to enhance diversity. Second, while peer-nomination inventories are widely regarded as the gold standard for assessing popularity in the literature (Cillessen & Marks, 2011), their use in measuring aggression has limitations. Questionnaire-based measures may offer a more systematic and reliable approach. Future studies should consider combining these methods to enhance accuracy in assessing both constructs. Third, the study used a cross-sectional design, limiting the ability to infer causality and the stability of these relationships over time. While longitudinal studies, such as Chmielowice-Szymanski et al. (2024), have explored the link between popularity and proactive relational aggression, further research on other types of aggression and their development from middle school to university is needed. Croatia's collectivistic cultural context, which emphasizes group harmony and

discourages aggression (Strohmeier et al., 2016), likely shapes social dynamics differently from individualistic cultures, where popularity is linked to self-promotion, and aggression can serve as a tool for dominance (Sheldon et al., 2017). To fully understand these variations, cross-cultural studies are essential in examining how cultural frameworks influence the relationship between popularity and aggression.

Conclusion

This research examined the relationship between peer-perceived popularity and different forms and functions of aggression in emerging adult women. The findings indicated that peer-perceived popularity was more related to proactive than reactive types of aggression, confirming that goal-oriented aggressive behaviors are prevalent among popular women. Moreover, proactive overt aggression and peer-perceived popularity exhibited a curvilinear trend, signifying that both low and high levels of popularity are associated with proactive overt aggression. The relationships between peer-perceived popularity and reactive types of aggression were more complex, suggesting that popularity dynamics in aggression among emerging adult women warrant further research.

Conflict of interest

We have no conflicts of interest to disclose.

Data availability statement

Data files are available upon a reasonable request.

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Supplementary Materials

Table A

An Exploratory Factor Analysis for Academic Achievement

Item	Academic achievement (factor loadings)
ECTS	.96
Exams passed	.91
GPA	.61
Eigenvalue	2.35
Proportion of variance explained	71%
Kaiser-Meyer-Olkin (KMO)	.66 (Overall)
Bartlett's Test of Sphericity	$X^2 = 288.83$, df = 3, $p < 0.01$

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Originalni naučni članak

Eksternalizovani problemi i zadovoljstvo životom adolescenata: Uloga socijalne podrške

Sofija Dovijanić [1]✉, Predrag Teovanović [1,2]

[1] *Fakultet za specijalnu edukaciju i rehabilitaciju, Univerzitet u Beogradu, Srbija*
[2] *LIRA lab, Univerzitet u Beogradu, Srbija*

SAŽETAK

Eksternalizovani problemi ponašanja odlikuju se kršenjem pravila, ispoljavanjem agresije, zanemarivanjem prava drugih i hiperaktivnošću. Prethodne studije nisu saglasne oko pitanja kvaliteta života mladih sa povišenim nivoom ovih problema. U ovoj studiji je ispitano da li eksternalizovani problemi predviđaju zadovoljstvo životom adolescenata, i da li socijalna podrška ima ulogu moderatora u tom odnosu. U istraživanju je učestvovalo 168 ispitanika srednjoškolskog uzrasta. Rezultati su pokazali da samo hiperaktivnost direktno predviđa nezadovoljstvo životom ($\beta = -.25$, $p = .006$), dok problemi u ponašanju imaju negativan uticaj samo u interakciji sa socijalnom podrškom ($\beta = -.25$, $p = .004$). Nije potvrđeno da povećanje podrške ima značajan pozitivni uticaj na zadovoljstvo ovih adolescenata, ali je uočena određena vrsta otpornosti na odsustvo podrške.

Ključne reči: eksternalizovani problemi, zadovoljstvo životom, socijalna podrška, adolescenti, SDQ

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✉ Kontakt imejl adresa: sofijadovijanic@gmail.com

Uvod

Eksternalizovani problemi ponašanja su grupa disruptivnih bihevioralnih problema koji su usmereni ka spoljašnjoj sredini, a obuhvataju različite oblike ponašanja koji se svrstavaju u ovaj klaster na osnovu zajedničkih indikatora, kao što su opozicioni i prkosni karakter ponašanja, ispoljavanje agresije, hiperaktivnost i antisocijalnost. U upotrebi su i izrazi *slabo kontrolisano*, *antisocijalno* i *spolja usmereno ponašanje* (Whitcomb, 2017).

Postoje različite klasifikacije eksternalizovanih problema (Kauten & Barry, 2020), a ovde je korišćena podela na probleme u ponašanju i hiperaktivnost (Aarø et al., 2022). *Problemi u ponašanju* predstavljaju relativno stabilno ispoljavanje antisocijalnog, agresivnog i izazivačkog ponašanja (SZO, 2010) čiji intenzitet, učestalost i trajanje nisu izraženi u meri koja je neophodna za postavljanje dijagnoze poremećaja ponašanja (Žunić-Pavlović i sar., 2010). *Hiperaktivnost* se ispoljava kao preterano aktivno, impulsivno ponašanje uz istovremeni deficit pažnje (Radulović, 2014).

Kada govorimo o *zadovoljstvu životom* mislimo na evaluaciju vlastitog celokupnog života kroz koju pojedinci procenjuju svoj život (Penezić, 2006). Konačno, *socijalna podrška* se tiče doživljaja pojedinca da je voljen i cenjen i da pripada organizovanom socijalnom krugu (Taylor, 2011).

U ovom radu ispitali smo opšte zadovoljstvo životom mladih sa eksternalizovanim problemima. Poseban aspekt teme istraživanja bio je značaj koji nivo socijalne podrške ima za zadovoljstvo životom.

Eksternalizovani problemi i zadovoljstvo životom

Istraživanja pokazuju da probleme mentalnog zdravlja prati niža ocena kvaliteta života (Stevanović, 2013), kao i da eksternalizovani problemi mogu dovesti do opadanja nivoa zadovoljstva životom (Caputi et al., 2019; Haranin et al., 2007; State & Kern, 2017) te do zloupotrebe supstanci, depresije, školskog neuspeha, socijalne izolacije i delinkvencije (Sagar et al., 2019). Potvrđena je visoka stopa udruživanja ovih problema sa internalizovanim problemima (Achenbach et al., 2016), što takođe može poslužiti kao indikator nezadovoljstva životom. Izraženi eksternalizovani

problemi kompromituju interpersonalno i školsko funkcionisanje, blagostanje i osećaj autonomije (Hunduma et al., 2022).

Hiperaktivnost narušava školsko funkcionisanje, udružuje se se drugim problemima učenja i može dovesti do prekida školovanja. Kvalitet socijalizacije je takođe uslovljen crtama hiperaktivnosti, te osobe sa visokom hiperaktivnošću često bivaju neuklopljenje u vršnjačku grupu, imaju poteškoće u razumevanju neverbalnih signala i oštećene interakcije. Sve ovo umanjuje samopouzdanje i emocionalno blagostanje (Eskander, 2020).

Možda najutemeljenije potkrepljenje za tezu da eksternalizovani problemi umanjuju nivo zadovoljstva možemo naći u radovima Patersona i saradnika (Patterson et al., 1992) koji u analizi komorbiditeta delinkvencije i depresije polaze od stava da delinkvencija otežava razvoj socijalnih i školskih veština i tako dovodi do tzv. *socijalnog neuspeha*, koji između ostalog uključuje odbacivanje od strane roditelja i vršnjaka (Hrnčić, 2011).

S druge strane, određeni istraživači ističu da je nezadovoljstvo prisutnije kod internalizovanih problema (Hunduma et al., 2022). Prema tom stanovištu, eksternalizovani problemi su povezani sa štetnim posledicama po druge i ne podrazumevaju nužno niži kvalitet života. Sigurno da postoji veći broj činilaca zadovoljstva životom i da faktori poput socijalizacije sa devijantnim vršnjacima mogu neutralisati pretpostavljene štetne efekte problema na nivo životnog zadovoljstva. Stevanović (2013) izveštava da u predikciji kvaliteta života važnu ulogu imaju samo emocionalni problemi, dok sa eksternalizovanim problemima postoji samo prividna veza.

Eksternalizovani problemi i socijalna podrška

Porodice mladih sa poremećajem ponašanja imaju brojne poteškoće u funkcionisanju. Tokom odrastanja mladi sa poremećajem ponašanja doživljavaju više nepovoljnih iskustava poput slabe prenatalne nege, neadekvatne ishrane, siromaštva i izloženosti fizičkom nasilju, dok se od psihopatoloških pojava kod roditelja izdvajaju zloupotreba supstanci, depresivni i somatizacijski poremećaj i antisocijalni poremećaj ličnosti (Sagar et al., 2019). Ovakva konstelacija porodičnih faktora ukazuje na umanjene resurse porodičnog sistema i daje osnov za pretpostavku da naša ciljna populacija nema dovoljno porodične podrške. Prema pojedinim autorima,

zbog problematičnog ponašanja svog člana, porodica može da povuče podršku, poveća distancu i odbije da razume ponašanje (Roosch Haraldsson & Cederqvist, 2016). Ima i stavova da se konflikti između roditelja i mladih sa disruptivnim ponašanjem delimično mogu pripisati neadekvatnoj reakciji roditelja na to ponašanje (Burt et al., 2005).

Kada govorimo o prijateljskim resursima, uočava se otežana integracija ovih mladih u primarnu vršnjačku grupu (Sagar et al., 2019). Sistematskim pregledom 24 studije koje su se bavile prijateljskim odnosima hiperaktivnih osoba ustanovljeno je da i oni u proseku imaju manje bliskih veza (Spender et al., 2023). Uopšteno, eksternalizovani problemi dugoročno predviđaju slabljenje bliskih prijateljskih odnosa, dok su površni odnosi očuvani (Dickson et al., 2017). Stoga, može se pretpostaviti da je problematično ponašanje ponekad praćeno prekidom prijateljskih odnosa. Ne smemo zaboraviti ni da se taj prekid može kompenzovati udruživanjem sa vršnjacima koji ispoljavaju rizično ponašanje (Patterson et al., 1992).

Socijalna podrška i zadovoljstvo životom

Percepcija socijalne podrške, ili doživljaj pojedinca da važne osobe iz njegovog okruženja brinu o njemu, doprinosi redukciji distresa tokom stresnih perioda (Taylor, 2011). Da je percepcija podrške bitna odrednica zadovoljstva adolescenata, pokazale su brojne studije, iako postoje neslaganja u pogledu prioriteta u značaju pojedinih oblika podrške (Danielsen et al., 2009; Jiménez-Iglesias et al., 2017; Leme et al., 2015). Studija na reprezentativnom uzorku mladih iz 42 zemlje potvrdila je slabu pozitivnu vezu između socijalne podrške i zadovoljstva, pri čemu se kao najvažniji izvor podrške izdvojila porodica, pa nastavnici i školski drugovi, dok se podrška prijatelja našla na poslednjem mestu (Bi et al., 2021).

Kada je reč o populaciji adolescenata sa izraženim eksternalizovanim problemima, istaživanja pokazuju da socijalna podrška može ublažiti negativne efekte problema u ponašanju i hiperaktivnosti na kvalitet života. Takođe, utvrđeno je da su mladi sa hiperaktivnim ponašanjem u manjem riziku da razviju dodatne bihevioralne i emocionalne probleme ukoliko imaju snažan sistem podrške, te je manja verovatnoća da će doći do pada kvaliteta života (Schei et al., 2015).

Ciljevi istraživanja

Analizom teorijskog okvira istraživanja stiče se utisak da eksternalizovane probleme obično prate određene negativne konsekvence po psihosocijalno funkcionisanje. Kako bismo to dublje istražili, pokušali smo da utvrdimo da li ovi problemi predviđaju zadovoljstvo životom adolescenata (prvi cilj). Takođe, proverili smo i da li nivo socijalne podrške moderira vezu između problema i zadovoljstva životom (drugi cilj). Pretpostavili smo da viši nivoi problema predviđaju niže zadovoljstvo (H1), kao i da negativni uticaj problema opada kako raste nivo podrške (H2).

Metod

Uzorak

Za procenu potrebne veličine uzorka pošlo se od pretpostavke o umerenom moderatorskom efektu socijalne podrške (f^2 = .15) na odnos između bihevioralnih problema i zadovoljstva, pri čemu su snaga testa i nivo značajnosti bili podešeni na 1-β = .95 i α = .05.

Ispitanici su uključeni u uzorak ukoliko se koriste srpskim jezikom i pohađaju bilo koji razred srednje škole. Predviđeno je isključivanje ispitanika sa razvojnim smetnjama koje kompromituju njihovu sposobnost samostalnog popunjavanja upitnika.

Procesom prigodnog uzorkovanja obuhvaćeno je 168 adolescenata prosečne starosti 16.49 godina (SD = 1.03), od kojih je 66.1% bilo ženskog pola. Učenici u istraživanju bili su učenici Druge ekonomske škole (56.0%) i Medicinske škole ,,Nadežda Petrović" (44.0%) u Beogradu. Najveći broj ispitanika pohađao je treći razred (29.8%), potom drugi (28.5%) i četvrti (25.0%), dok je najmanje bilo učenika prvog razreda (16.7%). Najzastupljenija kategorija školskog uspeha bio je vrlodobar (47.4%), pa dobar (28.2%) i odličan (23.1%), dok je broj dovoljnih i nedovoljnih bio zanemarljivo mali (ispod 1% u svakoj kategoriji).

Varijable i instrumenti

Podaci su prikupljeni tehnikom anketiranja. Korišćeni upitnik sadržao je pitanja o sociodemografskim karakteristikama (pol, uzrast i školski uspeh) i tvrdnje iz tri skale procene.

Eksternalizovana skala Upitnika snaga i teškoća (eng. Strengths and Difficulties Questionnaire - SDQ; Goodman, 1997)

Eksternalizovana skala Upitnika snaga i teškoća (Strengths and Difficulties Questionnaire - SDQ; Goodman, 1997), forme za samoprocenu adolescenata starosti između 11 i 16 godina, sadrži dve subskale (po pet tvrdnji svaka), a to su Problemi u ponašanju (npr. „*Često se razljutim i gubim kontrolu*") i Hiperaktivnost (npr. „*Stalno se vrpoljim i meškoljim*"). Format odgovora čini trostepena Likertova skala: 0 (*netačno*), 1 (*delimično tačno*) i 2 (*potpuno tačno*), pri čemu su ispitanici procenjivali u kojoj meri se svaka od tvrdnji odnosila na njih kada u obzir uzmu period od poslednjih šest meseci. Iako je u prethodnim studijama SDQ pokazao zadovoljavajuću unutrašnju konzistentnost (Popović-Ćitić i Bukvić, 2018), isto nije potvrđeno i za široku eksternalizovanu skalu (Aarø et al., 2022).

Multidimenzionalna skala percipirane socijalne podrške (eng. The Multidimensional Scale of Perceived Social Support - MSPSS; Zimet et al., 1988, adaptirala Miloševa, 2015)

Nivo podrške meren je pomoću domaće adaptacije instrumenta Multidimenzionalna skala percipirane socijalne podrške (eng. *The Multidimensional Scale of Perceived Social Support* - MSPSS; Zimet et al., 1988, adaptirala Miloševa, 2015) koji sadrži 12 tvrdnji (npr. „*Moja porodica se zaista trudi da mi pomogne*"). Tvrdnje su raspoređene u subskale Značajni drugi, Porodica i Prijatelji, kvantifikujući nivo podrške u svakom od ovih sistema. Format odgovora na pojedinačne stavke čini sedmostepena Likertova skala (od 1 = *uopšte se ne slažem* do 7 = *potpuno se slažem*). Na uzorku punoletnih srednjoškolaca u Srbiji potvrđena je dobra unutrašnja konzistentnost MSPSS (Petković i sar., 2021).

Skala zadovoljstva životom (SZŽ; Penezić, 2002)

Skala zadovoljstva životom (SZŽ; Penezić, 2002) meri zadovoljstvo životom putem 17 tvrdnji (npr. „*Zadovoljan sam svojim životom*") sa kojima su ispitanici iskazivali stepen slaganja putem sedmostepene Likertove skale (od 1 = *uopšte se ne slažem* do 7 = *potpuno se slažem*). Skala u celini ima veoma vrlo dobru unutrašnju konzistentnost za mlađi (Penezić, 2006) i stariji adolescentni uzrast (Tuce i Fako, 2014).

Ukupni skorovi su računati kao prosek odgovora na tvrdnje i mogu se kretati u rasponu 0-2 za SDQ, odnosno 1-7 za MSPSP i SZŽ, pri čemu viši skorovi ukazuju na veće prisustvo merene pojave.

Postupak prikupljanja podataka

Istraživanje je odobrila Etička komisija Odeljenja za psihologiju Filozofskog fakulteta Univerziteta u Beogradu (Protokol #2024-69). Podaci su prikupljeni u školskim kabinetima zadavanjem upitnika u papir-olovka formatu. Nakon predstavljanja teme istraživanja, istaknuto je da će podaci biti anonimni i da će se koristiti isključivo u naučno-istraživačke svrhe. Da bi se osigurala što bolja saradnja mladih, objašnjeno je da je njihov izbor za učešće bio nenameran i bez prethodnih saznanja o njihovim osobinama. Istaknuto je da je učešće u studiji dobrovoljno. Učenici pojedinačnih odeljenja su odgovarali istovremeno i imali su priliku da postavljaju pitanja. Popunjavanje upitnika je trajalo 10 minuta.

Priprema baze i obrada podataka

U početnoj bazi je nedostajalo 90 podataka, uglavnom na sociodemografskim varijablama. Odstranjivanje pravolinijskih obrazaca odgovora na skali podrške povećalo je broj takvih podataka za 204. Ispitanici sa nedostajućim podacima isključeni su iz onih analiza za koje su njihovi podaci bili nepostojeći ili uklonjeni. Dvanaest netipično visokih i niskih vrednosti na varijablama od interesa tretirano je postupkom vinzorizovanja.

Postupci deskriptivne statistike primenjeni su za utvrđivanje pouzdanosti skala, opis raspodele podataka i utvrđivanje povezanosti varijabli (Spirmanov koeficijent korelacije). Postupci statistike zaključivanja primenjeni su za proveru razlika u skorovima podrške (MANOVA za

ponovljena merenja), kao i za kreiranje regresionih modela za kriterijume zadovoljstva i socijalne podrške. Izvršena je moderatorska analiza uz vizuelno mapiranje efekata interakcije problema i podrške. Analize su sprovedene u programu IBM SPSS Statistics 26.

Rezultati

Rezultati iz Tabele 1 pokazuju da ispitanici imaju relativno visoke prosečne skorove na varijabli zadovoljstva životom i varijablama koje se tiču socijalne podrške.

Tabela 1

Raspodela Sumativnih Skorova na Subskalama Instrumenta, Interna Konzistentnost Skala i Parcijalne Korelacije

Varijabla	*N*	*M* (*SD*)	n_{stavki}	1	2	3	4	5	6	7	8
1. Zadovoljstvo životom	168	4.98 (0.95)	17	**.88**							
2. Socijalna podrška	148	5.69 (1.03)	12	.45***	**.87**						
3. Podrška prijatelja	148	5.64 (1.24)	4	.08	.74***	**.86**					
4. Podrška porodice	148	5.53 (1.55)	4	.46***	.83***	.03	**.90**				
5. Podrška značajnih drugih	148	5.91 (1.32)	4	.06	.71***	.51***	.10	**.89**			
6.Eksternalizovani problemi	167	0.70 (0.35)	10	**-**.13	.01	.11	-.16†	.007	**.68**		
7. Problemi u ponašanju	167	0.50 (0.32)	5	.12	-.14†	.04	-.24**	-.03	.95***	**.40**	
8. Hiperaktivnost	167	0.90 (0.48)	5	-.21*	.14†	.07	.04	.05	.98***	.49***	**.60**

Napomena. † marginalni nivo značajnosti.

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

Veličina i značajnost parcijalne korelacije između zadovoljstva i socijalne podrške sugerišu da je tokom adolescencije podrška važna determinanta zadovoljstva životom. Hiperaktivnost je jedina bihevioralna varijabla koja je povezana sa zadovoljstvom, i to negativno (r_s= -.21, p = .010).

Problemi u ponašanju bili su statistički značajno (negativno) povezani sa podrškom porodice (r_s = -.24, p = .004), što nije slučaj sa drugim oblicima podrške (p > .05). Status problema u ponašanju u kontekstu varijabli socijalne podrške dalje je istražen kroz regresionu analizu. Rezultati su potvrdili da ovi problemi predstavljaju neposredni prediktor niske podrške porodice (β = -.26, p = .011) kada se kontrolišu nivo hiperaktivnosti, pol, uzrast i školski uspeh. Ipak, ovaj model je objasnio samo 7% variranja kriterijuma (F = 3.13, p = .011, korigovani R^2 = .07), što znači da je redukcija podrške porodice usled problematičnog ponašanja prilično mala.

U narednom koraku smo ispitali da li eksternalizovani problemi i njegove dimenzije predviđaju zadovoljstvo životom. Kako bismo izbegli problem multikolinearnosti, najpre smo u regresioni model od bihevioralnih varijabli uključili samo varijablu eksternalizovani problemi, dok su ostali prediktori bili pol, uzrast, školski uspeh i socijalna podrška. Pored glavnih efekata, ispitana je i interakcija problema sa socijalnom podrškom. Iako je model u celini bio statistički značajan (F = 6.49, p < .001, korigovani R^2 = .20), eksternalizovani problemi nisu značajno predviđali nivo zadovoljstva (β = -.11, p > .05), a isto je važilo i za interakciju problema i socijalne podrške (β = -.10, p > .05). U drugi model su, umesto varijable eksternalizovani problemi, uključene pojedinačne varijable ponašanja (Tabela 2).

Tabela 2

Doprinosi Prediktora Objašnjenju Zadovoljstva Životom

Prediktor	β (*SE*)
Pol	0.16 (0.17)*
Uzrast	-0.07 (0.07)
Školski uspeh	0.18 (0.10)*
Socijalna podrška	0.45 (0.07)***
Problemi u ponašanju	0.16 (0.30)†
Hiperaktivnost	-0.25 (0.18)**
Problemi u ponašanju X Socijalna podrška	-0.25 (0.25)**
Hiperaktivnost X Socijalna podrška	0.11 (0.17)
F	7.62***
Korigovani R^2	.28

Napomena. † marginalni nivo značajnosti.

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

Kao što je prikazano u Tabeli 2, ovako združeni prediktori formiraju regresionu funkciju koja značajno objašnjava kriterijum ($F = 7.62$, $p < .001$), pri čemu je objašnjeno 28% varijanse zadovoljstva životom. Pol, školski uspeh i socijalna podrška dali su nezavisni doprinos objašnjenju zadovoljstva, tako da muški pol (β = .16, $p = .041$), bolji uspeh (β = .17, $p = .020$) i viši nivoi podrške (β = .45, $p < .001$) predviđaju veće zadovoljstvo. Uočeni su glavni efekti hiperaktivnosti (β = -.25, $p = .006$) i uslovni efekti problema u ponašanju (β = -.25, $p = .004$), pri čemu i hiperaktivnost i kombinovani efekti predviđaju niže vrednosti kriterijuma.

Radi lakše interpretacije efekata interakcije problema u ponašanju i socijalne podrške u predikciji zadovoljstva, kreirali smo njihovu vizuelnu reprezentaciju (Figura 1). Za potrebe crtanja grafika kreirali smo dihotomne varijable problema u ponašanju i socijalne podrške (Međedović, 2013). Ispitanici sa skorom problema iznad 80. percentila sačinjavaju grupu sa

visokim nivoom problema (Goodman, 1997), dok je prag podrške određen prema kriterijumu ±1SD od proseka (Chaplin, 2007).

Figura 1

Interakcija Problema u Ponašanju i Socijalne Podrške u Predviđanju Zadovoljstva Životom sa Intervalima Poverenja 95%

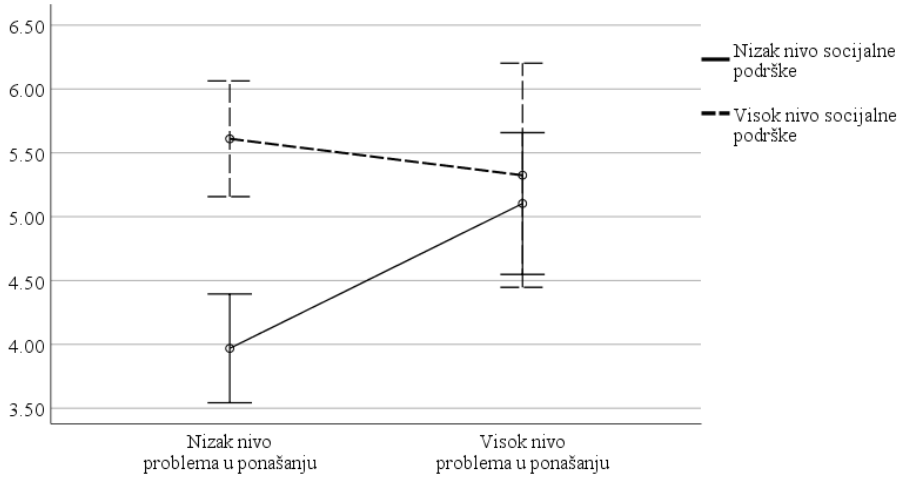

Figura 1 pokazuje da zadovoljstvo životom ispitanika koji ne ispoljavaju problematično ponašanje varira u zavisnosti od nivoa socijalne podrške. U ovoj grupi, ispitanici sa nižim nivoima podrške prijavljuju i veće nezadovoljstvo. Nasuprot tome, kod ispitanika sa izraženim problemima u ponašanju, zadovoljstvo životom ostaje relativno visoko čak i kada izostane podrška, a uočava se i njegov blagi porast kada se podrška poveća. Međutim, interval poverenja za ovu grupu ispitanika (visok nivo problema i visok nivo podrške) širi je u odnosu na preostale tri grupe, što implicira manju pouzdanost procene. Kako se ovaj interval u velikoj meri preklapa sa intervalom poverenja za grupu sa niskom podrškom, ne možemo reći da su razlike u zadovoljstvu u zavisnosti od nivoa podrške statistički značajne.

Zaključno, socijalna podrška pokazuje pozitivan uticaj na zadovoljstvo životom samo kod ispitanika sa niskim nivoom problema u ponašanju. Kod ispitanika sa izraženim problemima, povezanost između socijalne podrške i zadovoljstva nije uočena.

Diskusija

U ovoj studiji bavili smo se utvrđivanjem odnosa između eksternalizovanih problema, zadovoljstva životom i socijalne podrške tokom adolescencije, usredsređujući se na tri istraživačke hipoteze. Prva hipoteza, prema kojoj eksternalizovani problemi predviđaju niže zadovoljstvo životom je *potvrđena* u slučaju hiperaktivnosti, ali *nije potvrđena* u slučaju problema u ponašanju i širег klastera eksternalizovanih problema. Drugim rečima, hiperaktivnost je jedina varijabla problematičnog ponašanja koja predviđa nezadovoljstvo životom, i to nezavisno od toga da li su u pitanju devojčice ili dečaci, dobri ili loši đaci i da li postoji sistem podrške. Ovaj nalaz nije neočekivan i u skladu je sa drugim navodima (Bussing et al., 2010; Eskander, 2020) da hiperaktivnost nepovoljno utiče na psihosocijalno funkcionisanje mladih i da je prati sniženo blagostanje.

Za razliku od hiperaktivnosti, problemi u ponašanju nisu imali ulogu prediktora zadovoljstva životom adolescenata u našem uzorku. Na isti način ponašala se i varijabla eksternalizovani problemi. To nije očekivano s obzirom na brojne nalaze longitudinalnih (State & Kern, 2017; Zhu & Shek, 2020) i kros-sekcionih studija (Proctor et al., 2009; Sun & Shek, 2010; Valois et al., 2001) prema kojima agresivno ponašanje i delinkvencija neposredno ili posredno dovode do redukcije kvaliteta života. Ovo se posebno uočava u studijama koje su se bavile težim oblicima delinkventnog ponašanja i njihovim dugoročnim posledicama, koje svedoče o povišenom nezadovoljstvu štićenika korektivnih ustanova u poređenju sa adolescentima iz opšte populacije (De Ruigh et al., 2019; Van Damme et al., 2021). Naša studija se ipak pridružuje onim istraživanjima koja nisu otkrila negativne efekte disruptivnog ponašanja (Clark & Kirisci, 1996; Stevanović, 2013), što može biti posledica drugačije operacionalizacije problema u ponašanju i zadovoljstva životom, kao i upotrebe drugih mernih instrumenata. Jedna studija koja se dotakla pitanja odnosa između psihopatoloških fenomena i subjektivnog blagostanja pokazala je da psihopatologiju mladih ne mora da

prati nezadovoljstvo (Greenspoon & Saklofske, 2001). Treba se podsetiti da zadovoljstvo životom, kao ishod kognitivne procene života, sačinjava samo jednu dimenziju subjektivnog blagostanja (Poletto & Koller, 2011), te da ispitivanjem afektivne dimenzije ovog konstrukta možemo doći do širih saznanja o prirodi njegovog odnosa sa problemima u ponašanju. Pod afektivnom komponentom blagostanja podrazumevamo kvalitet i valencu emocionalnih doživljaja pojedinca, odnosno relativnu zastupljenost prijatnih emocija u odnosu na neprijatna emocionalna stanja (Jovanović i Novović, 2008). Podsetimo se i da je veći dao studija koje su zabeležile negativne efekte problematičnog ponašanja bio fokusiran na ozbiljno antisocijalno ponašanje, dok druge studije daju mešovite rezultate. Najzad, u našem istraživanju je primenjena skala SDQ koja, iako korisna za osnovnu procenu, možda nije dovoljno precizna za selekciju onih pojedinaca čije eksternalizujuće ponašanje je u toj meri izraženo da je opravdano očekivati negativne efekte i niži kvalitet života.

Sledeći nalaz koji smo dobili ovim istraživanjem pokazao je da su jedino problemi u ponašanju povezani sa nižim nivoom socijalne podrške, i to porodične (ne i podrške prijatelja i značajnih drugih). Ovaj rezultat u skladu je sa ranijim nalazima (Burt et al., 2005; Roosch Haraldsson & Cederqvist, 2016; Zhu & Shek, 2020), a nagoveštava da roditelji možda nemaju razvijene veštine upravljanja disruptivnim ponašanjem svoje dece. Podaci o pozitivnoj oceni vršnjačkih odnosa ne iznenađuju, budući da skala koja je primenjena za procenu tih odnosa ne diferencira između prijatelja iz primarne, prosocijalne i antisocijalne grupe vršnjaka. S druge strane, hiperaktivnost ne samo da ne dovodi do redukcije socijalne podrške već je uočeno i marginalno značajno povećanje podrške. Ovo možda potiče od savremenog shvatanja hiperaktivnosti kao problema učenja i razvoja, što zahteva podržavajući stav okruženja (Radulović, 2014).

Kao što je već pomenuto, problemi u ponašanju sami po sebi nisu neposredni prediktor zadovoljstva životom. Međutim, treći deo naših nalaza pokazuje da između ova dva fenomena ipak postoji *uslovna povezanost*, i to takva da problemi u ponašanju predviđaju nezadovoljstvo kroz interakciju sa socijalnom podrškom. Naime, iako su pojedinci sa izraženim problemima u određenoj meri zadovoljniji kada imaju socijalnu podršku, u ovoj studiji nije ustanovljeno da je ta razlika statistički značajna. Stoga, druga hipoteza, koja

pretpostavlja da negativan uticaj eksternalizovanih problema na zadovoljstvo životom opada sa porastom podrške, *nije potvrđena*. Još jedan argument za to je i nalaz da eksternalizovani problemi i problemi u ponašanju uopšte i ne dovode do nezadovoljstva životom. Ako polazimo od nalaza drugih autora, koji pokazuju da unapređenje socijalne mreže može da bude veoma korisno za mlade sa socioemocionalnim problemima (Bauer et al., 2021; Kelley et al., 2019), ovakav rezultat o međuodnosu tri varijable nije očekivan.

Daljim istraživanjem interakcije socijalne podrške i problema u ponašanju u delovanju na zadovoljstvo životom utvrđeno je da od četiri identifikovane grupe mladih (problematični podržani, problematični bez podrške, mirni podržani i mirni bez podrške), grupa mirne dece koja nemaju podršku porodice, prijatelja i drugih osoba zapravo predstavlja grupu sa najvećim nezadovoljstvom. Da je podrška važan faktor njihovog zadovoljstva pokazale su i njene najviše apsolutne vrednosti u grupi podržanih mirnih adolescenata. Ono što je interesantno jeste da zadovoljstvo nestašnih adolescenata ostaje relativno visoko bez obzira na nivo percepirane podrške. Čak i kada im se oduzme podrška najbližih osoba, oni i dalje procenjuju svoje živote kao ispunjujuće. Iako neobičan, ovaj nalaz se ipak može tumačiti u svetlu rezultata drugih studija. Može biti da kod ove populacije postoji iskrivljena percepcija svog života, i to u funkciji održanja pozitivne slike o sebi. Poznato je da su agresivna deca pristrasna u tumačenju neprijatnih informacija koje se tiču njih, poriču svoje negativne osobine i imaju preuveličanu samoprocenu u poređenju sa vršnjacima (Hughes et al., 1997). Ovo posebno važi za odbačenu agresivnu decu, koja iako zadržavaju realističnu percepciju okruženja preteruju u pozitivnoj samoproceni (Zakriski & Coie, 1996). Neki smatraju da su ova deca svesna da su odbačena, ali im to ne umanjuje samovrednovanje. Suprotno tome, mirni sebe vide kao inferiorne i nekompetentne (Estévez et al., 2014) što je u skladu sa našim rezultatom o najvećem nezadovoljstvu ove grupe. Problematični ne samo da imaju potrebu da očuvaju pozitivnu sliku o sebi, već imaju i nižu osetljivost na socijalno odbacivanje, te je manja verovatnoća da u slučaju odbacivanja nastupe negativna osećanja (Zimmer-Gembeck et al., 2013). Ovi nalazi su u skladu sa našim rezultatom koji pokazuje da su mladi koji krše norme veoma zadovoljni čak i onda kada nisu podržani. Autori u ovoj oblasti zastupaju stav da je to zadovoljstvo zapravo odbrambeno, a da nastaje onda kada spoljne okolnosti prete da naruše pozitivnu samopercepciju.

Postoje i alternativna objašnjenja zašto mladi koji krše norme imaju izraženo zadovoljstvo, iako nemaju podršku najbližih. Na primer, potvrđeno je da antisocijalno ponašanje često prate pozitivne emocije, uzbuđenje i samozadovoljstvo aktera (Ruedy et al., 2013). Ponašanja kao što su vandalizam, krađa, relaciona i proaktivna agresija mogu povećati nivo pozitivnih emocija (Davis & Allen, 2023) jer imaju za ishod lako pribavljanje dobara ili društvenu dominaciju, zadovoljavaju znatiželju i redukuju neprijatnost (Chester, 2017). Osim što direktno povećava pozitivno uzbuđenje, takvo ponašanje može da bude sredstvo održavanja emotivne homeostaze, popravljajući raspoloženje koje je narušeno negativnim iskustvima poput povlačenja spoljne podrške (Chester & DeWall, 2017). Postoji mišljenje da je upravo pozitivno uzbuđenje razlog zašto problematično ponašanje istrajava uprkos štetnim posledicama (Anderson & Linden, 2014; Chester, 2017). Stoga, može se pretpostaviti da se pozitivni afekat koji donose agresija i kršenje pravila reflektuje i na samoprocenu kvaliteta života. Istraživanja su pokazala da problematična deca imaju lične resurse koji doprinose njihovoj otpornosti, te da su zadovoljni podjednako kao i njihovi vršnjaci, iako imaju više negativnih emocija od njih (Poletto & Koller, 2011). Po svemu sudeći, ti resursi mogu biti upravo pozitivne emocije koje proizilaze iz kršenja normi.

Ograničenja istraživanja

Postoji nekoliko prepreka za uopštavanje dobijenih nalaza. Jedna je već pomenuta u prethodnom odeljku a tiče se *operacionalizacije konstrukata*. Iako podaci o zadovoljstvu životom predstavljaju važan izvor saznanja o funkcionisanju adolescenata sa problemima u ponašanju, nedostaju podaci o kvalitetu njihovog afektivnog funkcionisanja. Ako se setimo da je pozitivan utisak o životu moguć i onda kada je pojedinac neraspoložen i tužan i obrnuto, primećujemo da bi istovremeno ispitivanje afektiviteta možda dalo drugačije, a svakako bogatije nalaze. Drugim rečima, to što su naši mladi zadovoljni ne znači da kod njih ne postoji čitav spektar emocionalnih doživljaja u vezi sa kršenjem normi, koji obuhvata i negativne emocije. Moguće je da te emocije nemaju takav intenzitet koji bi doveo do značajne redukcije zadovoljstva. U tom smislu preporučujemo da se u budućim istraživanjima blagostanja koriste instrumenti koji pokrivaju obe

njegove komponente (kognitivnu i afektivnu) kao što je Kratka skala subjektivnog blagostanja (KSB; Jovanović i Novović, 2008) koja osim pozitivnog stava prema životu meri i pozitivni afektivitet.

Drugo ograničenje tiče se *karakteristika uzorka*. Eksterna validnost istraživanja je ograničena usled načina selekcije ispitanika i nereprezentativnosti uzorka. Rezultati zasnovani na podacima učenika srednjih stručnih škola u Beogradu ne mogu se bez rezerve primeniti na sve mlade. Takođe, uključivanje grupe sa većim stepenom problema u ponašanju (npr, mladih koji su imali iskustvo sukoba sa zakonom) bi potencijalno moglo dati drugačije rezultate.

Još jedno ograničenje tiče se primenjenog *metoda procene* i *mernih instrumenata*. Postoji mogućnost da bi upotreba indirektnih metoda za procenu zadovoljstva ukazala na negativnu samoprocenu adolescenata sa problemima. U idealnim okolnostima, indirektne metode trebalo bi koristiti u kombinaciji sa metodom samoprocene, a kako bismo dobili što potpuniju sliku o zadovoljstvu životom i njegovim odrednicama. Osim toga, instrument za procenu ponašanja nije pokazao zadovoljavajuću pouzdanost, što je umanjilo tačnost merenja varijabli ponašanja i potencijalno uticalo na dobijene rezultate.

Implikacije rezultata

Uprkos metodološkim nedostacima, nalazi ovog istraživanja imaju nekoliko teorijskih i praktičnih implikacija. Najvažnije je da u praksi tretmana problema u ponašanju ne treba računati na to da ove probleme prati nezadovoljstvo životom, što znači da je neophodno izdvojiti druge faktore koji će motivisati mlade da promene ponašanje u pravcu veće prosocijalnosti. Potrebno je preispitati postojeće paradigme prema kojima eksternalizovani problemi, a posebno kršenje normi, dovode do opadanja kvaliteta života. Potrebni su složeniji modeli koji objašnjavaju zadovoljstvo životom, koji uzimaju u obzir dodatne lične i sredinske faktore. Jedan od potencijalnih faktora koje treba uzeti u obzir – kvalitet emocionalnog funkcionisanja tj. relativna zastupljenost pozitivnog i negativnog afektiviteta – je već pomenut. Takođe, hiperaktivnost se ističe kao značajniji faktor nezadovoljstva nego što su to problemi u ponašanju, što ukazuje na potrebu za izdvajanjem specifičnih dimenzija hiperaktivnosti koje imaju tu ulogu. Da bi se poboljšao

kvalitet života mladih sa hiperaktivnim ponašanjem, treba osmisliti strategije koje ne zavise od socijalne podrške, već se više oslanjaju na psihoedukativne programe, bihevioralni ili kognitivno-bihevioralni tretman i po potrebi psihofarmakoterapiju. Ipak, najinteresantniji je nalaz da kršenje normi donosi određenu vrstu otpornosti na odsustvo podrške. Iako to nije bilo predmet studije, čini se da otpornost zajedno sa visokim zadovoljstvom može da deluje kao faktor prolongiranja ponašanja i tako kompromituje efektivnost intervencija u prevenciji i tretmanu. Utvrđivanje faktora otpornosti pružilo bi dublji uvid u odnos između problema u ponašanju, socijalne podrške i zadovoljstva životom. To bi omogućilo i kreiranje efektivnijih intervencija za mlade. Konačno, preporučuje se i razvijanje ili prilagođavanje psihometrijski podesnijih instrumenata za procenu problema u ponašanju za naše područje.

Zaključak

Hiperaktivnost direktno predviđa životno zadovoljstvo adolescenata, tako da veći broj simptoma prate niži nivoi zadovoljstva životom. S druge strane, problemi u ponašanju nisu direktno povezani sa zadovoljstvom, ali socijalna podrška ima važnu moderatorsku ulogu u ovom odnosu. U uslovima razvijene podrške, adolescenti pokazuju sličan, visok nivo zadovoljstva, bez obzira na to da li su skloni kršenju normi ili nisu. U uslovima niske podrške, međutim, nivo zadovoljstva mladih koji krše norme ostaje na istom nivou, za razliku od njihovih vršnjaka, kod kojih nastupa nezadovoljstvo. Pretpostavili smo da ovde važnu ulogu imaju potreba za očuvanjem pozitivne samopercepcije, ali i same karakteristike problema u ponašanju koje deluju u pravcu povećanja zadovoljstva životom kod ove grupe mladih. S druge strane, najveće nezadovoljstvo imaju mirna deca koja nemaju razvijenu socijalnu podršku. Svi ovi nalazi sugerišu da kršenje normi zapravo deluje protektivno u odnosu na životno zadovoljstvo, i da je pri odsustvu sistema podrške adaptivnije biti nestašan. Uočava se potreba za složenijim moderatorskim i medijatorskim modelima objašnjenja zadovoljstva životom adolescenata sa eksternalizovanim problemima, posebno problemima u ponašanju.

Sukob interesa

Nemamo sukoba interesa za prijavljivanje.

Izjava o dostupnosti podataka

Podaci su dostupni na lični zahtev kontaktiranjem autorke.

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Do externalizing problems predict adolescents' life satisfaction: The role of social support

Sofija Dovijanić [1], Predrag Teovanović [1,2]

[1] *Faculty of Special Education and Rehabilitation, University of Belgrade, Serbia*
[2] *Laboratory for Research of Individual Differences, Department of Psychology, Faculty of Philosophy, University of Belgrade, Serbia*

ABSTRACT

Externalizing problems include various forms of behavior characterized by rule-breaking, aggression, disregard for others and hyperactivity. Previous research has shown inconsistent findings regarding the life satisfaction of adolescents with elevated levels of externalizing symptoms. In this study, we examined if these problems predict adolescents' life satisfaction, and whether social support moderates this relationship. A total of 168 high–school aged adolescents participated in the study. We found that only hyperactivity (β = -.25, p = .006) and interaction of conduct problems and social support negatively predicted adolescents' life satisfaction (β = -.25, p = .004). Though it was not confirmed that increasing social support for troubled adolescents leads to higher levels of life satisfaction, we did notice a certain type of resilience to the lack of social support.

Keywords: externalizing problems, life satisfaction, social support, adolescents, SDQ

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Research Article

The Effectiveness of Applied Behavior Analysis in Developing Academic Skills Among Students With Autism Spectrum Disorder: An Evaluative Study in Morocco

Brahim Nadir[1], Abdellatif El Farahi[1]

[1] *Abdelmalek Esaadi University, Higher Normal School, Tetouan, Morocco*

ABSTRACT

This study aimed to evaluate the academic skills (reading, mathematics, and writing) of students with autism spectrum disorder (ASD) who are benefiting from interventions based on applied behavior analysis (ABA-based) and students with ASD who are not benefiting from ABA-based interventions in Morocco (The cities of Tetouan, M'diq, Fnideq, and Martil). The sample consisted of 112 students (56 in each group) with ASD without intellectual disability. We used Raven's Matrices to measure the level of general non-verbal intelligence, the CARS-2-HF diagnostic test to determine the degree of ASD, and then a skill measurement tool, which is the Assessment of Basic Language and Learning Skills – Revised (The ABLLS-R®), to evaluate the academic skills of students with ASD participating in the study. The results indicated that students with ASD who used ABA-based interventions showed improvement and development in academic skills compared to students who did not use ABA-based interventions. The results showed statistically significant differences between the two groups (reading: $F = 34.188$, $p < .001$; mathematics: $F = 44.308$, $p < .001$; writing: $F = 13.298$, $p < .001$), indicating that the differences are not random, but rather a result of the interventions based on applied behavior analysis. These results may give hope to students with ASD who may develop their academic skills by using ABA-based interventions instead of being integrated into educational institutions without intervention, which leads many of them to not keep up with the curriculum and levels of education.

Keywords: autism spectrum disorder, applied behavior analysis, academic skills, reading, mathematics, writing

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✉ Corresponding author's email: nadirbrahim217@gmail.com

Introduction

Autism spectrum disorder (ASD) is characterized by impairments in social interaction and communication and the presence of restricted and repetitive behaviors (APA, 2013). The average prevalence of ASD in the world now, according to a systematic review of a group of studies published from 2012 to 2021, is about one child per 100 children (Zeidan et al., 2022). The prevalence has increased globally since the 1990s (Zeidan et al., 2022); in the United States (US), it increased from 1 in 150 children born in 1992 (Autism and Developmental Disabilities Monitoring Network Surveillance Year 2000 Principal Investigators & Centers for Disease Control and Prevention, 2007) to 1 in 36 children born in 2012 (Maenner et al., 2023). Academic skills refer to basic reading, writing, and mathematical skills (Dunlap et al., 2001). The ability to read, write, and do math is critical to the intellectual and adaptive functioning of students with ASD, especially with increased attention focused on ensuring that students with ASD are making sufficient academic progress and have access to the general education curriculum (Watkins et al., 2019).

Interventions for individuals with ASD, including behavioral interventions, have often focused on social interaction, communication, self-reliance, and other functional skills, in contrast to academic skills, which have received little attention from researchers (Keen et al., 2015). However, with the introduction of inclusive education for these individuals, their increased access to educational institutions, and attention to ensuring the quality of their education and their ability to keep up with academic education, the interest in interventions that focus on academic skills has increased (Schaefer Whitby, 2013; Watkins et al., 2019).

Applied behavior analysis (ABA) is the application of the science of behavior to address socially important problems. It focuses on observable behaviors and how these are influenced by environmental variables. ABA is used to improve the lives of diverse populations with various concerns; most commonly, it is used to improve developmental and educational outcomes in disabled populations, particularly ASD (Anderson & Hudson, 2022). ABA procedures involve the use of instructional strategies in a systematic, explicit manner to help individuals acquire, maintain, and generalize skills (Cooper et al., 2020). Behavioral interventions focused on academic skills have typically

combined explicit, systematic academic instruction with ABA strategies, such as reinforcement, prompting, modeling, chaining, self-monitoring, and task analysis, to teach new skills and/or correct errors. Such practices have been used effectively across academic content areas with individuals with ASD (Watkins et al., 2022).

ABA, as a practice, is the application of the principles of applied behavior analysis (strategies such as reinforcement, indoctrination, shaping, sequencing, differential reinforcement, etc.), which include a set of interventions such as Early Intensive Behavioral Interventions, discrete trial teaching, pivotal response training, verbal behavior, incidental teaching, behavioral skills training, social skills groups, etc. The effectiveness of interventions based on applied behavior analysis has been recognized by a group of organizations, including Autism Speaks, the United States Surgeon General, the American Psychological Association, the Association for Behavior Analysis International, and the National Institute of Mental Health (Leaf et al., 2021).

In Morocco, inclusive education was recently implemented (school year 2019/2020), allowing Moroccan students with Autism Spectrum Disorder (ASD) to access regular classrooms. While inclusive education itself is a significant achievement, students with ASD face various challenges in acquiring academic skills, as well as in their overall teaching and educational processes. A group of these students benefited (and still benefit) from ABA-based interventions, which helped them overcome academic difficulties. These interventions have benefited students within centers specialized in rehabilitating ASD and within regular classrooms. However, a large share of students with ASD was not included in these interventions. Reasons included the lack of centers providing ABA-based interventions, the lack of specialists in ABA, the holders of the Board Certified Behavior Analyst (BCBA) considering ABA-based interventions as not evidence-based, etc.

The schooling of children with disabilities in general, and those with ASD in particular, has historically been difficult to implement and apply effectively. However, with the efforts of the Ministry of National Education, inclusive education has become a feasible project, as the concept of inclusive education has been activated. Morocco has gone through three stages in the education of children with disabilities, including children with

ASD. The first stage began with special education (starting in 1968), followed by the second stage, which was Integration Education (1994, with the establishment of the first integration department), and the third stage, which is the inclusive education stage. This third stage is based on a set of international laws (e.g., the International Convention on the Rights of the Child, 1993) and national laws (e.g., the Constitution of the Kingdom of Morocco, 2011, Article 34), the strategic vision 2015-2030 (Lever 4), and Framework Law 17-51 (Article 25). Perhaps the greatest contribution to implementing inclusive education is due to Ministerial Resolution No. 047.19, dated June 24, 2019, and Framework Law 51.17, issued in the Official Gazette on August 19, 2019, under No. 6805.

The present study aims to examine the effectiveness of ABA-based interventions in improving academic skills among students with ASD by evaluating the academic skills of students who benefit from ABA-based interventions and those who do not benefit from them. We hypothesize that there will be a statistically significant relationship between engaging in ABA-based interventions for students with ASD and developing reading skills, math skills, and writing skills. Specifically, we expect students with ASD who participate in ABA-based interventions to show improvements in reading, math, and writing skills.

Method

Participants

The sample consisted of two groups of students aged 6-10 years, all diagnosed with ASD (according to DSM-5 criteria) without mental impairment. Each group included 56 students enrolled in either public or private educational institutions at the first, second, or third primary level. The first group used ABA-based interventions, while the second group did not.

The field component was provided to the two groups in the primary educational institutions affiliated with the regional directorate in Tetouan (Moulay Hassan Primary School, Mohammed VI Primary School, Resources and Rehabilitation Hall of the regional directorate in Tetouan, Resources and Rehabilitation Hall of the Technical Development Center in Tetouan) and the regional directorate in M'diq-Fnideq (Qassem Amin Primary School, Omar

Ibn Al-Khattab Primary School, January 11 Primary School), in addition to the centers for ASD (Amal Association for Autistic Children in Fnideq, My Mother Association for ASD and Similar Disorders in M'diq, Hanan Association in Tetouan).

Regarding the equivalence of students in the two groups, it was assessed using Raven's Matrices to measure general non-verbal intelligence and the CARS-2-HF diagnostic test to determine the degree of ASD, including intelligence and autism scores. Additionally, both groups were accepted into educational institutions alongside their peers, with some students studying in the same department. All participants were from the cities of Tetouan and M'diq-Fnideq.

Students who did not use ABA-based interventions received care in centers that do not implement any interventions (i.e., students benefit solely from care without receiving any specific intervention). Inside the school, they receive an education similar to that of their peers, with the added benefit of access to the resource and rehabilitation room, which provides support and review without using any formal intervention.

Measures

The Assessment of Basic Language and Learning Skills–Revised: The ABLLS-R®

The ABLLS-R is an assessment tool, reference guide, and tracking system that measures the language and learning skills of children with developmental disorders, particularly those with ASD (Gabig, 2013). This tool consists of 25 domains and 544 objectives. Applying this assessment requires knowledge of the principles and strategies of ABA (reinforcement, indoctrination, sequencing, shaping, etc.).

The assessment was designed to help families, educators, and specialists identify the level of children's skills in various areas. For this paper, we selected only three out of 25 domains of ABLLS-R. Specifically, we used the tool to assess three academic skills - reading, mathematics, and writing. Previous studies found ABLLS-R to have high internal consistency (i.e., reading: $\alpha = 0.90$, mathematics $\alpha = 0.91$, writing $\alpha = 0.91$) and test-retest

reliability (Partington et al., 2016). Moreover, previous studies suggest satisfactory content validity (Usry et al., 2018).

The total of each of the skills evaluated in this paper includes the following (according to the ABLLS tool): 54 goals and standards in the reading skill, 76 goals and standards in the mathematics skill, and 34 goals and standards in the writing skill. We calculated the acquired goals and standards and used their total for statistical analyses.

Raven's Matrices

The Raven test measures general nonverbal intelligence in individuals aged 5 years and older (Bilker et al., 2012). Since the test was first published (Raven, 1938), it has evolved into a group of well-known versions (Raven, 1989; Raven, Raven, & Court, 1998; Raven, 2000). For this paper, we used the version known as Raven's Advanced Progressive Matrices Review, which contains 36 matrices divided into three groups (A, AB, B), with 12 matrices per group.

The Childhood Autism Rating Scale - Second Edition High-Functioning -

(CARS-2-HF)

The CARS-2 is one of the most important and widely used diagnostic tests for ASD (along with the ADI-R and ADOS-2 tests) due to its diagnostic accuracy and effectiveness in identifying this disorder (Zwaigenbaum & Penner, 2018). The CARS-2 (Schopler et al., 2010) includes three models. The first model is the CARS2-ST test, which is intended for children aged 2 to 6 years who have a clear communication deficit and an IQ lower than 79. The second model, the CARS2-QPC test, is intended for parents or caregivers. The third model, the CARS-2-HF, is intended for children aged 6 years and older who have high functional ability and no communication deficits (Vaughan, 2011). In this study, we used the CARS-2-HF test to determine the degree of ASD.

Procedure

The approval of the Regional Directorate of Education in Tetouan and the Regional Directorate of Education in M'diq-Fnideq was obtained (Reference No.: 403/24), as well as the approval of the rehabilitation centers

for individuals with ASD (associations). The three instruments were administered in schools affiliated with the two regional directorates and in the centers where these individuals benefit. In addition, informed consent was obtained from the parents of all students with ASD.

We based the inclusion and exclusion criteria on the following conditions: 1) excluding participants who had a concomitant mental disability (according to a medical certificate) or who had a below-average performance in IQ (measured by the Raven Matrix), 2) excluding cases that recorded a severe level of autism (measured by the CARS-2-HF), 3) excluding non-speaking participants, 4) excluding participants who were over 10 years old, 5) excluding participants who were pursuing their studies at the fourth primary level or above, 6) excluding participants who suffered from violent or aggressive behaviors.

All participants were tested and evaluated individually in a room either at the school or the centers. The experimenter initially engaged the students in conversations on general topics of interest to them in order to establish a good relationship. This was done with the help of the teacher for the students evaluated at school and the special education specialist for those evaluated at the centers. The lack of pre-measurement of exposure to applied behavior analysis is primarily due to the fact that beneficiaries of these interventions differed in the duration of their benefits. Specifically, their benefits in private centers ranged from 6 months to 4 years (4 hours per week for 10 months per year). In contrast, other students did not benefit from ABA interventions, leading to differences in their development of academic skills, as noted in the current study.

Data analysis

All statistical analyses were performed using IBM SPSS Statistics for Windows, version 26. We computed descriptive statistics (i.e., minimum, maximum, mean, and standard deviation) to gain initial insight into the number of acquired objectives and standards for each group. We used the Pearson correlation coefficient to measure the correlation between three variables (reading, mathematics, and writing). We then used a multiple analysis of variance (MANOVA) to compare the differences between the study variables (reading, mathematics, and writing) in terms of the number of

goals achieved by the group of students with ASD who benefit from ABA-based interventions and the group of students with ASD who do not benefit from ABA-based interventions.

Results

As shown in Table 1, reading, math, and writing scores were, on average, higher in students with ASD who engaged in ABA-based interventions compared to those who did not.

Table 1

Descriptive Statistics for the Two Groups

Measure	Group ASD (ABA-based interventions)				Group ASD (no ABA-based interventions)			
	Min	Max	*M*	*SD*	Min	Max	*M*	*SD*
Reading	6.00	54.00	44.14	13.78	1.00	54.00	26.50	17.28
Math	3.00	76.00	57.26	20.72	1.00	67.00	28.44	24.90
Writing	2.00	34.00	31.17	7.77	2.00	34.00	24.35	11.64

Specifically, the difference between the groups in reading performance was significant ($F(1,110) = 34.18$, $p < .001$). Similarly, significant differences were found in mathematics scores ($F(1,110) = 44.30$, $p < .001$) and writing ($F(1,110) = 13.29$, $p < .001$). These Results suggest that group membership had a significant and meaningful impact on academic skills across all three areas, with the strongest group effect observed in mathematics, followed by reading and then writing (see Table 2).

Table 2

Between-group Differences in Reading, Mathematics, and Writing

Source	Variable	Sum of Squares	*df*	Medium square	*F*	*p-value*	Partial η^2
group	Reading	8400.893	1	8400.893	34.188	$p < .001$	0.237
	Math	23258.893	1	23258.893	44.308	$p < .001$	0.287
	Writing	1302.893	1	1302.893	13.298	$p < .001$	0.108
error	Reading	27030.214	110	245.729			
	Math	57742.821	110	524.935			
	Writing	10777.071	110	97.973			
Total corrected	Reading	35431.107	111				
	Math	81001.714	111				
	Writing	12079.964	111				

Discussion

In Morocco, inclusive education started in the 2019/2020 school year. The present study is the first study in Morocco to evaluate the effectiveness of ABA-based interventions in developing the academic skills of students with ASD, comparing those who benefit from these interventions to those who do not. To examine the effectiveness of ABA-based interventions, the current study evaluated the academic skills of students who benefited from them and those who did not.

Our results have shown that the ABA-based interventions group scored higher on all three measures (i.e., reading, writing, math) than the group who did not benefit from such interventions. Such results suggest that ABA-based interventions may be effective in developing and improving the academic skills of students with ASD.

A number of previous studies have demonstrated the effectiveness of ABA-based interventions through the use of a range of strategies. In a study of 3 children with ASD learning to identify and label novel letters (Arabic and Greek) using a video modeling strategy, the three participants were able to master identifying and naming the target letters through self-modeling (Marcus & Wilder, 2009). A study indicated the effectiveness of the Discrete Trial Training (DTT) intervention in teaching word recognition skills to students with ASD (Kamps et al., 1990). A study used stimulus superimposition and

fading strategies to teach sight-word reading skills to a 6-year-old student with ASD. The experiment found that these strategies were effective, as the student was able to read 14 out of 15 words (Birkan et al., 2007). In another study, to generalize sight word reading skill to 6 participants with ASD, aged 5 to 8 years, using a time delay strategy, the experiment confirmed that the participants learned the target words, indicating the effectiveness of the time delay behavioral procedure (Ledford et al., 2008).

Reading comprehension is more complex than reading letters and words, as it requires a set of characteristics, such as processing the text and understanding its meaning, in addition to integrating the text with previously acquired knowledge (Singh et al., 2020). A number of studies have focused on effective behavioral interventions for teaching reading comprehension. One effective intervention for reading comprehension for individuals with ASD is direct instruction - an educational intervention that falls within the ABA-based interventions. It refers to an organized and systematic educational approach under the supervision of the teacher, whose role is to build skills in a sequential and cumulative manner (Watkins et al., 2022). This approach uses assistance to elicit correct student responses and break down complex skills into component parts (Finnegan & Mazin, 2016).

One previous study that used direct instruction to teach reading comprehension skills to students with ASD has found a functional relationship between direct instruction and participants' reading comprehension skills (Flores & Ganz, 2007). In a study of 11 students with ASD using direct instruction similar to the previous study to teach reading comprehension, the results found statistically significant differences in learners' reading comprehension skills over time (Flores et al., 2013). In a comparative study using two reading comprehension interventions (i.e., teacher-directed instruction and iPad®-assisted instruction) on three elementary students with ASD , the results revealed the effectiveness of both interventions in reading comprehension skill, but the teacher-directed instruction intervention was more effective in increasing response accuracy for reading comprehension (El Zein et al., 2015). Another study indicated the effectiveness of direct instruction on the comprehension of science texts for three secondary school students with ASD (Carnahan et al., 2016).

A number of studies have shown variation in the level of students with ASD in mathematics skills, and some studies have indicated the possibility of the existence of special strengths in individuals with ASD in mathematics skills (Baron-Cohen et al., 2007). Other studies have reported that individuals with ASD, on average, have average mathematics-related skills (Titeca et al., 2014), and that about a quarter of individuals with ASD have difficulty learning mathematics skills (Donaldson & Zager, 2010). Most studies of mathematics skills in individuals with ASD have focused on number and arithmetic skills (Alresheed et al., 2018). ABA strategies used in teaching mathematics skills include: reinforcement, task analysis, video modeling, and time delay (Watkins et al., 2022).

A number of reviews have examined interventions researchers have used to teach mathematics to individuals with ASD, which have included applied behavioral interventions or the integration of these strategies into intervention packages (Gevarter et al., 2016; Ehsan et al., 2018). One study compared two ABA strategies, no-no prompting and simultaneous prompting, to teach mathematics to three children with ASD. The results indicated that the no-no prompting strategy was more effective than the simultaneous prompting strategy (Leaf et al., 2010).

Another study examined the teaching of a mathematics skill (computation of sales tax) in addition to a set of other skills to three students, including a student with ASD, using a time delay strategy. The study found that this strategy was effective in acquiring and maintaining skills, in addition to generalizing them (Collins et al., 2011). A study found that a package of behavioral interventions that included video modeling (based on the iPad), gradual fading, reinforcement, prompts and forward chaining were effective in acquiring basic arithmetic skills (identifying and writing numbers from 1-7 and understanding the quantity each number represents) for a child with ASD (Jowett et al., 2012). Another study demonstrated a functional relationship between video self-modeling and mathematics skill (mathematical problem) in three students with ASD (Burton et al., 2013). A study demonstrated the effectiveness of a video modeling strategy in solving word problems involving subtracting mixed fractions with unfamiliar denominators in three high school students with ASD (Yakubova et al., 2015). A study confirmed the positive effect of a visual support strategy on solving equations, as high-

functioning student with ASD was able to solve algebraic equations with this intervention (Barnett & Cleary, 2019).

In writing, a set of ABA-based interventions were used to teach functional and academic handwriting skills to individuals with ASD (Pennington & Carpenter, 2019). A study used video modeling, token economy, reinforcement, and backward chaining strategies to teach a child to write her full name, and the results found that the intervention was acceptable (Moore et al., 2013). Another study, involving three participants, including two with ASD (a 7-year-old female and a 12-year-old male), evaluated the effects of a response prompting strategy (constant time delay, system of least prompts) on sentence writing, and the results indicated that the intervention package was effective for all participants in sentence writing (Pennington et al., 2016). A study used a package of interventions including modeling, self-monitoring, and feedback to improve letter writing skills in three participants, including one with ASD, and all participants were able to improve their letter writing skills (Pennington et al., 2014).

A group of students face difficulty in acquiring academic skills, due to a set of factors that include; difficulties in memory, comprehension, attention, and social behavior (Ledbetter-Cho et al., 2020). In addition, students with below-average IQs face difficulty in keeping up with academic skills, which affects their academic future and shows a delay in this area compared to their peers (Keen et al., 2015). In this context, many students with ASD need intervention to develop their academic skills to continue to keep up with all levels of education. A set of interventions has shown an improvement in academic skills in these individuals, in addition to the emergence of long-term and significant results in academic skills due to these interventions that these learners received (Ledbetter-Cho et al., 2020).

It has been difficult to identify effective interventions for students with ASD. This is due to the relatively limited research in this area compared to interventions targeting social interaction, communication, and other functional behaviors. Researchers have had difficulty identifying interventions that are effective and improve academic skills for individuals with ASD (Watkins et al., 2022). Dunlap et al. (2001) suggested that ABA may be effective for individuals with ASD in the area of academic skills. They identified a set of indicators that make ABA particularly appropriate for

academic instruction, focusing on tailoring intervention strategies to the specific needs of each individual, emphasizing an emphasis on experimentation, direct observation of outcomes, and documentation of effective and replicable instructional practices and procedures (Dunlap et al., 2001).

In a comprehensive review of strategies used in content area instruction for students with ASD, which focused primarily on academic skills (reading, writing, and mathematics), a range of effective interventions were found, including a) visual supports; (b) technology-based instruction (e.g., computer-assisted instruction, video modeling); (c) concrete representation; (d) direct instruction; and (e) behavioral interventions (e.g., time delay) (Spencer et al., 2014). The review by Spencer et al. (2014) supports our Results regarding the effectiveness of ABA interventions in academic skills, as most of the interventions discussed by Spencer et al. (2014) belong to ABA, such as a) visual supports; (b) technology-based instruction (e.g., computer-assisted instruction, video modeling); direct instruction; and behavioral interventions (e.g., time delay). A number of recent literature reviews have examined several studies that have addressed academic skills interventions for individuals with ASD, which include ABA-based interventions and other interventions (Alresheed et al., 2018; Tárraga-Mínguez et al., 2020).

Fleury et al. (2014) found that a range of ABA practices—including task analysis, direct instruction, response prompting procedures, visual supports, modeling, and time delay—are associated with the development and improvement of academic skills for high school students with ASD. Additionally, a review identified 25 interventions aimed at enhancing academic skills and/or school readiness, which included various ABA practices and strategies, such as direct instruction, discrete trial training, extinction, modeling, prompting, reinforcement, task analysis, time delay, and video modeling (Steinbrenner et al., 2020).

Through our study, along with a group of studies we have discussed, including the studies by Spencer et al. (2014) and Fleury et al. (2014), it becomes clear that ABA-based interventions are effective, especially when using some of the strategies and interventions (e.g., direct instruction, time delay, video modeling…) mentioned in our research.

In general, intervention strategies based on the principles of ABA are effective at targeting academic outcomes for individuals with ASD (Gevarter et al., 2016). There is an increased emphasis on specific academic interventions for learners with ASD in the literature, especially given the positive outcomes associated with improved academic performance and the need to develop effective, replicable procedures to target academic outcomes (Teacher-implemented video-schedule intervention; Ledbetter-Cho et al., 2020). Additionally, the incorporation of behavioral procedures into academic instruction may produce more robust results than interventions that do not utilize behavioral strategies (e.g., Solis et al., 2016). Many studies have also used ABA strategies within a technology framework to teach academic skills (Ledbetter-Cho et al., 2018; Root et al., 2017).

This study may help guide families toward the benefits of ABA-based interventions for their children, potentially improving their academic performance in reading, math, and writing. It also aims to encourage centers to adopt applied behavior analysis as an evidence-based practice, providing effective services to beneficiaries and training their staff in these interventions. Furthermore, the Moroccan government, through its Ministry of National Education, is encouraged to offer support to schools in implementing these interventions within regular classrooms. This can be achieved through various strategies, such as reinforcement, behavior contracts, token economies, and prompting, to enhance and develop the academic skills of students with ASD.

Limitations and future directions

Although the study results suggest the effectiveness of applied behavior analysis (ABA)-based interventions by comparing students with autism spectrum disorder (ASD) who benefit from these interventions with those who do not, several limitations must be acknowledged. First, the study focused exclusively on students diagnosed with ASD, making it difficult to generalize the results to other neurodevelopmental disorders. Additionally, the participants were aged 6 to 10 years, restricting the applicability of the findings to other age groups. second, the study did not compare ABA-based interventions with alternative interventions (e.g., cognitive interventions), leaving it unclear whether other methods might yield similar outcomes.

Limitations highlight the need for future research in this area of academic skill achievement for elementary, middle, and high school students with ASD. Future research with larger sample sizes is necessary to enhance the generalizability of results. Further research is needed to continue examining additional ways to use ABA-based interventions to improve procedural and conceptual academic skills for students with ASD. Maintenance is particularly important because academic skills develop from the mastery of prior skills. Mastery of basic academic skills allows students with ASD to focus on more complex problems in the future and generalize skills.

Conclusion

In summary, the current study examined the effectiveness of applied behavior analysis (ABA)-based interventions by assessing the academic skills of students who benefited from these interventions and those who did not. The results indicated that students who benefited from ABA interventions performed higher in academic skills than students who did not. The results of this study contribute to emerging trends supporting ABA interventions for students with autism spectrum disorder (ASD) and expanding the scope of teaching academic skills. Several previous studies have demonstrated that ABA-based interventions can be considered evidence-based practices in academic settings, but further research is needed to address the academic needs of students with ASD.

Conflict of interest

We have no conflicts of interest to disclose.

Data availability statement

Data used in this paper are available upon a reasonable request.

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