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Article

Protective pathways against adolescent cyberbullying: democratic parenting, online risk behavior, and the mediating role of digital literacy

Maria Ulfa, Ria Safaria Sadif, Amanda Putri Amalia, Hartati S Mey Wally
Universitas Muhammadiyah Buton

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ABSTRACT

Adolescents' engagement in digital spaces has increased exposure to cyberbullying, while protective mechanisms linking family context, online risk behavior, and digital competence remain insufficiently explained. This study examined protective pathways against adolescent cyberbullying by testing the effects of democratic parenting and online risk behavior on cyberbullying vulnerability, with digital literacy as a mediator. A cross-sectional survey was conducted among 200 senior high school students from SMAN 1 Baubau, SMAN 2 Baubau, and SMAN 3 Baubau, selected through stratified purposive sampling. Data were analyzed using PLS-SEM with SmartPLS 3.0. The measurement model met validity and reliability criteria. The structural model explained 51.6% of the variance in digital literacy and 59.4% in cyberbullying vulnerability. Democratic parenting positively predicted digital literacy ($\beta = 0.586$, $p < .001$) and negatively predicted cyberbullying vulnerability ($\beta = -0.251$, $p < .001$). Online risk behavior negatively predicted digital literacy ($\beta = -0.248$, $p < .001$) and positively predicted cyberbullying vulnerability ($\beta = 0.423$, $p < .001$). Digital literacy negatively predicted cyberbullying vulnerability ($\beta = -0.269$, $p < .001$) and mediated both relationships. Findings imply that cyberbullying prevention should strengthen democratic parenting, reduce online risk behavior, and develop digital literacy through school counseling and family-based interventions.

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Corresponding Author:

Maria Ulfa,
Universitas Muhammadiyah Buton,
Email: maria.ulfa@umbuton.ac.id

Introduction

Cyberbullying has become a critical psychosocial and educational problem in adolescents' digital lives. As social interaction increasingly moves into digital spaces, adolescents use social media and online communication platforms not only for entertainment, but also for identity expression, peer recognition, social participation, and emotional connection. However, these same digital environments may expose adolescents to harmful interactions, including online harassment, humiliation, social exclusion, rumor spreading, impersonation, and the circulation of embarrassing or hostile content. Unlike traditional bullying, cyberbullying can occur beyond school boundaries, persist across time and space, involve anonymity, and reach a wider audience, thereby increasing its psychological consequences for adolescents. Meta-analytic evidence has shown that cyberbullying

victimization is positively associated with depression among adolescents, indicating that cyberbullying is not merely a digital communication problem but also a serious mental health and educational concern (Hu et al., 2021; Kwan et al., 2020; Marciano et al., 2020; Zhu et al., 2021).

Adolescents represent a particularly vulnerable group in the digital environment because they are in a developmental phase characterized by identity exploration, emotional sensitivity, peer orientation, and increasing autonomy. The World Health Organization describes adolescence as a unique stage of human development marked by rapid physical, cognitive, and psychosocial growth that shapes how young people think, feel, make decisions, and interact with the world (Organization, 2024). In online settings, these developmental characteristics may increase adolescents' sensitivity to peer approval, social comparison, digital rejection, and impulsive responses to online conflict (Boer et al., 2020; Savoia et al., 2021; Wang et al., 2025). Therefore, cyberbullying vulnerability among adolescents should be understood within the interaction between developmental needs, family guidance, digital competence, and risky online behavior.

Existing studies on cyberbullying have frequently emphasized risk factors, such as high digital technology use, weak parental supervision, low self-control, and exposure to harmful online interaction. However, focusing only on risk factors is insufficient to explain how adolescents can be protected from cyberbullying. A stronger explanatory approach is needed, namely a protective pathways perspective, which examines how family-based protection, digital competence, and online behavior interact to reduce adolescents' vulnerability to online harm. Recent evidence indicates that parental factors, including warmth, monitoring, and mediation, are relevant protective factors against bullying and cyberbullying victimization among children and adolescents (Grama et al., 2024; Rega et al., 2022; Sevilla-Fernandez et al., 2025; Tan et al., 2025). Thus, cyberbullying prevention should not be viewed only as a matter of controlling internet use, but also as a process of strengthening protective capacities within family and educational environments.

Democratic parenting is one of the most relevant family-based protective factors in adolescent development. It is characterized by emotional warmth, open communication, rational supervision, autonomy support, and respect for adolescents' opinions. In the context of digital life, democratic parenting may help adolescents internalize responsibility, regulate their online behavior, evaluate the consequences of digital interaction, and communicate openly with parents about online experiences. Previous research has shown that parenting styles can function as either protective or risk factors for traditional bullying and cyberbullying victimization, depending on the degree of warmth, reasoning, supervision, and coercive control present in family interaction (Atman Uslu & Yildiz Durak, 2022; Durak et al., 2025; Elsaesser et al., 2017; Martínez et al., 2019). Therefore, democratic parenting may serve as an important foundation for reducing adolescents' vulnerability to cyberbullying.

In addition to family factors, online risk behavior is a crucial predictor of cyberbullying vulnerability. Online risk behavior refers to adolescents' digital practices that increase their exposure to online harm, such as sharing personal information, accepting unknown contacts, engaging in hostile comment threads, accessing harmful content, joining unregulated online groups, responding impulsively to digital conflict, or interacting without adequate privacy awareness. This construct is more conceptually precise than general internet-use intensity because it focuses on adolescents' specific digital practices that increase exposure to content, conduct, contact, and privacy risks (Aizenkot, 2020; Babilonova et al., 2024; OECD, 2021; Savoia et al., 2021; Wang et al., 2025). Studies on children's and adolescents' online behavior show that online engagement may provide opportunities for learning and communication, but it also brings risks that require continuous monitoring and protection strategies (Luthfia et al., 2021; Rodriguez-de-Dios et al., 2018). Therefore, online risk behavior is theoretically closer to cyberbullying vulnerability than mere duration of digital media use.

Digital literacy represents a central protective competence in this model. It should not be reduced to technical ability to operate digital devices, but should be understood as a broader cognitive, ethical, social, and safety-related capacity. Digital literacy includes the ability to access and evaluate digital

information, protect personal data, understand online privacy, recognize harmful content, communicate ethically, manage digital identity, and respond appropriately to online threats. Prior studies indicate that digital literacy is associated with students' online risk, digital participation, and cyberbullying experiences, especially when combined with parental mediation and digital guidance (Kusumalestari et al., 2023; Moon & Bai, 2020; Purnama et al., 2021; Tao et al., 2022). Tao et al., (2022), for example, found that digital literacy and parental mediation are relevant in explaining the relationship between digital technology use and cyberbullying experiences.

The relationship between democratic parenting and digital literacy can be explained through the role of the family as a primary environment for digital socialization. Adolescents raised in democratic family environments are more likely to experience open dialogue, rational guidance, supportive monitoring, and reflective communication about digital activities. Such parenting practices may encourage adolescents to ask questions, evaluate online content critically, understand digital ethics, and develop safer digital habits. This argument is consistent with recent findings showing that parenting style, parental mediation, and digital parenting awareness are associated with adolescents' digital literacy and parental supervision in cyberbullying prevention (Chen et al., 2023; Durak et al., 2025; Kusumalestari et al., 2023; Sevilla-Fernandez et al., 2025). Thus, democratic parenting is expected to strengthen adolescents' digital literacy.

Online risk behavior may also be associated with adolescents' level of digital literacy. Adolescents who frequently engage in risky online practices may have limited capacity to assess digital consequences, protect personal information, regulate online interaction, and identify harmful digital situations. In this sense, digital literacy can function as a mediating protective competence that explains how adolescents' family environment and online risk behavior are linked to cyberbullying vulnerability. A lack of digital literacy may make adolescents less capable of recognizing online threats and managing digital conflict, while stronger digital literacy may help them respond to harmful interaction more safely and responsibly. Research on online risk and digital literacy shows that adolescents' risky online practices are associated with digital competence, parental mediation, and the ability to recognize and mitigate online risks (Luthfia et al., 2021; Purnama et al., 2021; Savoia et al., 2021; Wang et al., 2025).

Despite the growing literature on cyberbullying, several research gaps remain. First, Previous studies have examined parenting, digital literacy, online risk behavior, and cyberbullying from separate perspectives, but integrated models that place digital literacy as a mediating protective competence remain limited (Grama et al., 2024; Purnama et al., 2021; Rega et al., 2022; Tao et al., 2022; Wang et al., 2025). Second, many studies have focused on internet-use intensity, whereas online risk behavior may provide a more precise explanation of adolescents' vulnerability to cyberbullying. Third, digital literacy has frequently been treated as a direct predictor or moderator, while its mediating role in the relationship between democratic parenting, online risk behavior, and cyberbullying vulnerability remains insufficiently examined. Fourth, existing studies still need stronger protective models that explain not only why adolescents become vulnerable to cyberbullying, but also how family and digital competence may reduce such vulnerability.

This study addresses these gaps by proposing a protective pathways model that integrates democratic parenting as a family-based protective factor, online risk behavior as a digital behavioral risk factor, and digital literacy as a mediating protective competence. Unlike models that merely examine the direct effect of digital media use on cyberbullying, this study positions digital literacy as a mechanism through which democratic parenting and online risk behavior may influence adolescents' vulnerability to cyberbullying. The proposed model is expected to contribute theoretically to cyberbullying literature by clarifying the interaction between family protection, digital competence, and online behavioral risk. Practically, the findings may inform school counseling programs, parental education, and digital literacy-based interventions aimed at preventing cyberbullying among adolescents.

Based on this framework, this study aims to examine protective pathways against adolescent cyberbullying by analyzing the effects of democratic parenting and online risk behavior on

cyberbullying vulnerability, with digital literacy as a mediating variable. Specifically, this study investigates: (1) the effect of democratic parenting on digital literacy; (2) the effect of online risk behavior on digital literacy; (3) the effect of digital literacy on cyberbullying vulnerability; (4) the direct effects of democratic parenting and online risk behavior on cyberbullying vulnerability; and (5) the mediating role of digital literacy in the relationships between democratic parenting, online risk behavior, and cyberbullying vulnerability.

Methods

Research Design

This study employed a quantitative cross-sectional survey design to examine the protective pathways against adolescent cyberbullying. The model tested the relationships among democratic parenting, online risk behavior, digital literacy, and cyberbullying vulnerability. A cross-sectional design was considered appropriate because the data were collected at one point in time to capture students' perceptions, digital behavior, family parenting experiences, and vulnerability to cyberbullying. The study was explanatory in nature because it aimed to test direct and indirect relationships among latent variables. Democratic parenting and online risk behavior were positioned as independent variables, digital literacy as a mediating variable, and cyberbullying vulnerability as the dependent variable.

Research Setting, Population, and Sample

The study was conducted in three senior high schools in Baubau City, Indonesia: SMAN 1 Baubau, SMAN 2 Baubau, and SMAN 3 Baubau. The target population consisted of 350 senior high school students from grades X, XI, and XII. Senior high school students were selected because adolescence is a developmental period characterized by intensive peer interaction, active digital media use, and greater exposure to online social risks, including cyberbullying.

The final sample consisted of 200 students. This number was considered adequate because it exceeded the minimum sample requirement calculated from the finite population of 350 students with a 5% margin of error, which required approximately 187 respondents. Therefore, a sample of 200 students was considered sufficient for statistical analysis and SEM-PLS estimation.

Sampling Technique

This study used stratified purposive sampling with proportional allocation. The population was first stratified based on school origin, namely SMAN 1 Baubau, SMAN 2 Baubau, and SMAN 3 Baubau. Stratification was applied to ensure that students from each participating school were represented in the sample. Within each school stratum, respondents were selected purposively based on predetermined inclusion criteria. Proportional allocation was used to determine the number of respondents from each school according to the size of the student population in that school. The proportional allocation followed the formula:

$$n_h = \frac{N_h}{N} \times n$$

where nh represents the population size of each school stratum, N represents the total population of 350 students, and n represents the final sample size of 200 students.

Tabel 1. Proportional Allocation of Population and Sample

School	Population	Formula	Sample
SMAN 1 Baubau	124	124 / 350 × 200	71
SMAN 2 Baubau	110	110 / 350 × 200	63
SMAN 3 Baubau	116	116 / 350 × 200	66
Total	**350**		**200**

Based on this calculation, the sample was proportionally distributed across SMAN 1 Baubau, SMAN 2 Baubau, and SMAN 3 Baubau according to the number of eligible students in each school.

This sampling technique was selected because the study required respondents who met specific criteria related to digital media use and adolescent school status, while still maintaining proportional representation across the three schools.

Table 2. Demographic Characteristics of Respondents

Demographic Variable	Category	Frequency (n)	Percentage (%)
School	SMAN 1 Baubau	71	35.5
	SMAN 2 Baubau	63	31.5
	SMAN 3 Baubau	66	33.0
	Total	**200**	**100.0**
Class	X	71	35.5
	XI	65	32.5
	XII	64	32.0
	Total	**200**	**100.0**
Gender	Male	87	43.5
	Female	113	56.5
	Total	**200**	**100.0**
Age	15 years	31	15.5
	16 years	83	41.5
	17 years	60	30.0
	18 years	26	13.0
	Total	**200**	**100.0**
Daily Internet Access	< 2 hours	32	16.0
	2–4 hours	72	36.0
	5–7 hours	57	28.5
	> 7 hours	39	19.5
	Total	**200**	**100.0**
Main Digital Device	Smartphone	150	75.0
	Laptop/Tablet	39	19.5
	Combination	11	5.5
	Total	**200**	**100.0**
Main Social Media Platform	WhatsApp	52	26.0
	Instagram	61	30.5
	TikTok	56	28.0
	Facebook	31	15.5
	Total	**200**	**100.0**

Source: Processed research data, 2026.

Based on Table 1, the respondents were relatively balanced across the three participating schools and grade levels. The majority of respondents were female (56.5%) and aged 16–17 years, indicating that most participants were in the middle-adolescent stage. Most students accessed the internet for 2–7 hours per day, while smartphones were the dominant digital device used by respondents. Instagram, TikTok, and WhatsApp were the most frequently used social media platforms. These demographic characteristics indicate that the respondents were active digital media users, making them relevant for examining online risk behavior, digital literacy, and cyberbullying vulnerability among adolescents.

Inclusion and Exclusion Criteria

Students were included if they were active senior high school students in grades X, XI, or XII at one of the participating schools; had experience using digital media or social media; were able to understand and complete the questionnaire independently; agreed to participate voluntarily; and obtained parental or guardian consent. Students were excluded if they were absent during data collection, declined to participate, did not obtain parental or guardian consent, submitted incomplete

questionnaires, or provided patterned responses indicating inattentive answering. Responses with excessive missing data or inconsistent answer patterns were removed before analysis.

Ethical Procedures and School Permission

Before data collection, formal permission was obtained from the participating schools. The research objectives, participant criteria, questionnaire content, estimated completion time, confidentiality procedures, and voluntary nature of participation were explained to school principals or authorized representatives. Because the participants were adolescents, parental or guardian consent and student assent were obtained before questionnaire completion. Students were informed that participation was voluntary and that they could withdraw at any time without academic consequences. The questionnaire was administered anonymously, and students were not required to provide names or other identifying information. All responses were used only for academic research purposes and reported in aggregate form.

Instrument Development and Pilot Test

The research instrument was developed by adapting indicators from previous studies and theoretical constructs related to democratic parenting, online risk behavior, digital literacy, and cyberbullying vulnerability. The questionnaire used a five-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree. Democratic parenting was grounded in the authoritative/democratic parenting framework, which emphasizes parental warmth, open communication, rational supervision, autonomy support, and responsibility-based freedom. Therefore, this construct was measured through indicators of open parent–child communication, parental involvement, autonomy support, rational supervision, and responsibility-based freedom (Kusumalestari et al., 2023; Martínez et al., 2019). Online risk behavior was conceptualized as adolescents' risky digital practices that increase exposure to online harm, including sharing personal information, interacting with unknown users, engaging in hostile online conversations, accessing harmful content, and responding impulsively to online conflict (Purnama et al., 2021; Savoia et al., 2021; Wang et al., 2025). Digital literacy was based on a multidimensional digital competence framework covering information evaluation, digital ethics, privacy protection, online safety, and responsible digital interaction (Moon & Bai, 2020; Purnama et al., 2021; Tao et al., 2022). Cyberbullying vulnerability was conceptualized as adolescents' susceptibility to direct or indirect harmful online experiences and was measured through exposure to cyberbullying, perceived online risk, victimization experience, and indirect involvement in harmful digital interactions (Chun et al., 2020; Kwan et al., 2020; Zhu et al., 2021).

Before the main survey, a pilot test was conducted involving 50 students from two classes at SMAN 3 Baubau. These students had similar characteristics to the target respondents but were not included in the main sample. The pilot test aimed to assess item clarity, readability, content relevance, and preliminary reliability. Items that were unclear, overlapping, or difficult to understand were revised before the final questionnaire was administered.

Data Collection Procedure

Data were collected using a structured self-report questionnaire. Before completing the questionnaire, students received standardized instructions regarding the purpose of the study, confidentiality, voluntary participation, and how to respond to the items. The questionnaire was completed during a time agreed upon with the schools so that it did not interfere with regular learning activities. The estimated completion time was approximately 15–20 minutes. After data collection, all responses were screened for completeness and response quality. Incomplete questionnaires, duplicate responses, and patterned answers were excluded from the final dataset before statistical analysis.

Data Analysis

Data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with SmartPLS 3.0. SEM-PLS was selected because the model involved latent variables measured by multiple indicators and required simultaneous testing of measurement including reliability, convergent validity, discriminant validity, collinearity, explanatory power, effect size, predictive relevance, and bootstrapped mediation testing (Benitez et al., 2020; J. F. Hair et al., 2019; J. Hair &

Alamer, 2022; Richter et al., 2022; Shmueli et al., 2019). First, the measurement model was evaluated through outer loading, Cronbach's alpha, composite reliability, Average Variance Extracted (AVE), and the Heterotrait–Monotrait Ratio (HTMT). These tests were used to assess indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. Second, the structural model was evaluated by examining the Variance Inflation Factor (VIF), path coefficients, coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), and Standardized Root Mean Square Residual (SRMR). The significance of direct and indirect effects was tested using the bootstrapping procedure in SmartPLS 3.0. Path coefficients, t-statistics, p-values, and confidence intervals were used to determine the significance and direction of the hypothesized relationships. The mediation effect of digital literacy was examined by testing the indirect effect of democratic parenting on cyberbullying vulnerability through digital literacy and the indirect effect of online risk behavior on cyberbullying vulnerability through digital literacy. Mediation was considered significant when the bootstrapped indirect effect was statistically significant.

Results and Discussion

Results

Measurement Model Evaluation

The measurement model was evaluated to ensure that all constructs met the criteria for validity and reliability before testing the structural relationships. The evaluation included indicator reliability, internal consistency reliability, convergent validity, and discriminant validity.

The outer loading results showed that all indicators exceeded the recommended threshold of 0.70. The outer loading values ranged from 0.870 to 0.908 for cyberbullying vulnerability, from 0.858 to 0.892 for democratic parenting, from 0.864 to 0.891 for digital literacy, and from 0.856 to 0.909 for online risk behavior. These results indicate that all indicators were adequate in representing their respective latent constructs. Therefore, no indicator was removed from the measurement model.

Table 3. Measurement Model Evaluation: Construct Reliability and Convergent Validity

Construct	Indicator Range	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Cyberbullying Vulnerability	0.870–0.908	0.934	0.935	0.950	0.792
Democratic Parenting	0.858–0.892	0.922	0.923	0.941	0.762
Digital Literacy	0.864–0.891	0.929	0.932	0.947	0.780
Online Risk Behavior	0.856–0.909	0.925	0.929	0.943	0.770

The results of internal consistency reliability and convergent validity are presented in Table 4. All constructs had Cronbach's alpha and composite reliability values above 0.70, indicating satisfactory internal consistency. The AVE values were also above 0.50 for all constructs, confirming convergent validity. Specifically, the AVE values were 0.792 for cyberbullying vulnerability, 0.762 for democratic parenting, 0.780 for digital literacy, and 0.770 for online risk behavior. These findings demonstrate that more than 50% of the variance in the indicators was explained by their corresponding latent constructs.

Discriminant validity was assessed using the Heterotrait–Monotrait Ratio (HTMT). As shown in Table 5, all HTMT values were below 0.85, indicating that each construct was empirically distinct from the others. The highest HTMT value was found between democratic parenting and digital literacy (0.731), which remained below the recommended threshold. Therefore, the model demonstrated adequate discriminant validity.

Table 4. HTMT Results

Construct Relationship	HTMT
Democratic Parenting – Cyberbullying Vulnerability	0.639
Digital Literacy – Cyberbullying Vulnerability	0.682
Online Risk Behavior – Cyberbullying Vulnerability	0.691
Digital Literacy – Democratic Parenting	0.731
Online Risk Behavior – Democratic Parenting	0.405
Online Risk Behavior – Digital Literacy	0.501

Structural Model Evaluation

After the measurement model met the required criteria, the structural model was evaluated. The assessment included collinearity, explanatory power, effect size, model fit, predictive relevance, direct effects, indirect effects, and total effects. The inner VIF values ranged from 1.166 to 2.064, indicating that the model did not suffer from multicollinearity problems. The VIF values were below the commonly accepted threshold, suggesting that the predictor constructs were sufficiently independent in explaining the endogenous constructs.

Table 5. Inner VIF Values

Path	VIF	Decision
Democratic Parenting → Digital Literacy	1.166	No multicollinearity
Online Risk Behavior → Digital Literacy	1.166	No multicollinearity
Democratic Parenting → Cyberbullying Vulnerability	1.876	No multicollinearity
Digital Literacy → Cyberbullying Vulnerability	2.064	No multicollinearity
Online Risk Behavior → Cyberbullying Vulnerability	1.293	No multicollinearity

The coefficient of determination showed that the model explained a substantial proportion of variance in the endogenous constructs. Democratic parenting and online risk behavior explained 51.6% of the variance in digital literacy. Meanwhile, democratic parenting, online risk behavior, and digital literacy explained 59.4% of the variance in cyberbullying vulnerability. These values indicate that the model had adequate explanatory power in the context of adolescent cyberbullying vulnerability.

Table 6. R-Square Results

Endogenous Construct	R^2	Adjusted R^2	Interpretation
Digital Literacy	0.516	0.511	Moderate
Cyberbullying Vulnerability	0.594	0.588	Moderate to substantial

The effect size analysis showed that democratic parenting had a large effect on digital literacy (f^2 = 0.609), while online risk behavior had a small-to-moderate effect on digital literacy (f^2 = 0.109). In predicting cyberbullying vulnerability, online risk behavior showed the strongest effect size (f^2 = 0.341), followed by digital literacy (f^2 = 0.087) and democratic parenting (f^2 = 0.083). These results indicate that online risk behavior was the most influential direct predictor of cyberbullying vulnerability, whereas democratic parenting was the strongest predictor of digital literacy.

Table 7. Effect Size f^2

Path	f^2	Interpretation
Democratic Parenting → Digital Literacy	0.609	Large
Online Risk Behavior → Digital Literacy	0.109	Small to moderate
Democratic Parenting → Cyberbullying Vulnerability	0.083	Small
Digital Literacy → Cyberbullying Vulnerability	0.087	Small
Online Risk Behavior → Cyberbullying Vulnerability	0.341	Medium to large

Model fit was examined using the Standardized Root Mean Square Residual (SRMR). The SRMR value was 0.043, indicating an acceptable model fit. The NFI value was 0.916, further suggesting that the model had adequate fit. Although PLS-SEM primarily emphasizes prediction and explained variance, these model fit results provide additional support for the adequacy of the proposed structural model.

Predictive Relevance

The predictive relevance of the model was assessed using the blindfolding procedure in SmartPLS 3.0 with an omission distance of 7. The cross-validated redundancy Q^2 values for the endogenous constructs were greater than zero. Digital literacy obtained a Q^2 value of 0.391, while cyberbullying vulnerability obtained a Q^2 value of 0.462. These results indicate that the model had satisfactory predictive relevance for both endogenous constructs.

Table 8. Cross-Validated Redundancy Q^2

Endogenous Construct	SSO	SSE	Q^2
Digital Literacy	1000.000	608.628	0.391
Cyberbullying Vulnerability	1000.000	538.128	0.462

In addition, the cross-validated communality values were positive for all constructs, ranging from 0.633 to 0.677. This indicates that the indicators had adequate predictive quality in representing their respective latent constructs. Therefore, the blindfolding results support the predictive relevance of the proposed protective pathway model.

Hypothesis Testing: Direct Effects

The significance of the direct effects was tested using bootstrapping in SmartPLS 3.0. The results are presented in Table 9. All direct relationships were statistically significant and supported the proposed hypotheses. Democratic parenting had a positive and significant effect on digital literacy ($\beta = 0.586$, $t = 13.440$, $p < .001$), supporting H1. This indicates that higher levels of democratic parenting were associated with higher levels of digital literacy among adolescents. Online risk behavior had a negative and significant effect on digital literacy ($\beta = -0.248$, $t = 5.041$, $p < .001$), supporting H2. This finding indicates that adolescents who engaged more frequently in online risk behavior tended to show lower levels of digital literacy.

Digital literacy had a negative and significant effect on cyberbullying vulnerability ($\beta = -0.269$, $t = 4.219$, $p < .001$), supporting H3. This result indicates that higher digital literacy was associated with lower cyberbullying vulnerability. Democratic parenting also had a negative and significant effect on cyberbullying vulnerability ($\beta = -0.251$, $t = 4.351$, $p < .001$), supporting H4. This confirms that democratic parenting functions as a protective factor against cyberbullying vulnerability. Furthermore, online risk behavior had a positive and significant effect on cyberbullying vulnerability ($\beta = 0.423$, $t = 8.071$, $p < .001$), supporting H5. This indicates that adolescents who engaged in higher levels of online risk behavior were more vulnerable to cyberbullying.

Table 9. Direct Effect Hypothesis Testing

Hypothesis	Path	β	t-value	p-value	95% CI	Decision
H1	Democratic Parenting → Digital Literacy	0.586	13.440	< .001	[0.494, 0.670]	Supported
H2	Online Risk Behavior → Digital Literacy	-0.248	5.041	< .001	[-0.353, -0.158]	Supported
H3	Digital Literacy → Cyberbullying Vulnerability	-0.269	4.219	< .001	[-0.395, -0.145]	Supported
H4	Democratic Parenting → Cyberbullying Vulnerability	-0.251	4.351	< .001	[-0.366, -0.140]	Supported
H5	Online Risk Behavior → Cyberbullying Vulnerability	0.423	8.071	< .001	[0.299, 0.519]	Supported

Mediation Testing: Indirect Effects

The mediation effect of digital literacy was examined by testing the specific indirect effects. The results are presented in Table 10. Digital literacy significantly mediated the relationship between democratic parenting and cyberbullying vulnerability ($\beta = -0.158$, $t = 3.802$, $p < .001$), supporting H6. The confidence interval did not include zero, indicating that the indirect effect was statistically significant. Since the direct effect of democratic parenting on cyberbullying vulnerability also remained significant, the mediation can be interpreted as partial mediation.

Digital literacy also significantly mediated the relationship between online risk behavior and cyberbullying vulnerability ($\beta = 0.067$, $t = 3.570$, $p < .001$), supporting H7. This finding indicates that online risk behavior increased cyberbullying vulnerability partly through its negative association with digital literacy. Because the direct effect of online risk behavior on cyberbullying vulnerability remained significant, the mediation was also partial. However, the indirect effect was smaller than the direct effect, suggesting that online risk behavior primarily contributes to cyberbullying vulnerability through a direct risk pathway, while digital literacy provides an additional explanatory mechanism.

Table 10. Indirect Effect Hypothesis Testing

Hypothesis	Indirect Path	β	t-value	p-value	95% CI	Mediation Type
H6	Democratic Parenting → Digital Literacy → Cyberbullying Vulnerability	-0.158	3.802	< .001	[-0.238, -0.085]	Partial mediation
H7	Online Risk Behavior → Digital Literacy → Cyberbullying Vulnerability	0.067	3.570	< .001	[0.033, 0.104]	Partial mediation

Total Effects

The total effect results further clarify the overall contribution of democratic parenting and online risk behavior to cyberbullying vulnerability. Democratic parenting had a negative total effect on cyberbullying vulnerability ($\beta = -0.409$, $t = 8.613$, $p < .001$). This indicates that democratic parenting reduced cyberbullying vulnerability both directly and indirectly through digital literacy. Online risk behavior had a positive total effect on cyberbullying vulnerability ($\beta = 0.490$, $t = 9.644$, $p < .001$), indicating that online risk behavior increased cyberbullying vulnerability both directly and indirectly through digital literacy.

Table 11. Total Effects

Path	Total Effect	t-value	p-value	95% CI
Democratic Parenting → Cyberbullying Vulnerability	-0.409	8.613	< .001	[-0.502, -0.323]
Online Risk Behavior → Cyberbullying Vulnerability	0.490	9.644	< .001	[0.372, 0.583]

Discussion

The findings of this study provide empirical support for the proposed protective pathway model against adolescent cyberbullying. The model demonstrates that cyberbullying vulnerability is not merely a consequence of adolescents' exposure to digital media, but is shaped by the interaction between family-based protection, online behavioral risk, and digital competence. Democratic parenting was found to increase digital literacy and reduce cyberbullying vulnerability, whereas online risk behavior decreased digital literacy and increased cyberbullying vulnerability. Digital literacy also significantly reduced cyberbullying vulnerability and mediated the relationships between democratic parenting, online risk behavior, and cyberbullying vulnerability. These findings strengthen the argument that cyberbullying prevention should not rely solely on restricting

adolescents' internet use, but should also focus on strengthening family communication, reducing risky online behavior, and improving adolescents' digital literacy.

The significant positive effect of democratic parenting on digital literacy confirms the important role of the family as a primary context for adolescents' digital socialization. Adolescents who experience open communication, emotional warmth, rational supervision, autonomy support, and responsibility-based freedom are more likely to develop the capacity to use digital media critically and responsibly. This finding is consistent with studies showing that authoritative or democratic parenting is associated with higher levels of adolescent digital literacy, compared with authoritarian, permissive, or neglectful parenting styles (Kusumalestari et al., 2023). In the present study, democratic parenting appears to function not only as a general psychosocial resource, but also as a family-based mechanism that supports adolescents in understanding digital ethics, privacy, online safety, and responsible digital interaction.

This result also supports the broader literature on parental involvement and mediation in adolescents' digital lives. Systematic reviews on parental mediation indicate that parents play an important role in shaping children's and adolescents' social media use, particularly when mediation is based on communication, guidance, and active involvement rather than merely restrictive control (Sevilla-Fernandez et al., 2025). Therefore, democratic parenting may be more effective in strengthening digital literacy because it allows adolescents to discuss online experiences, ask questions, negotiate boundaries, and internalize digital norms. In this sense, family protection works not through authoritarian prohibition, but through dialogic and developmental guidance.

The negative effect of online risk behavior on digital literacy indicates that adolescents who engage more frequently in risky online practices tend to have lower levels of digital literacy. Online risk behavior in this study refers to behaviors such as sharing personal information, interacting with unknown users, engaging in hostile online conversations, accessing harmful content, and responding impulsively to digital conflict. This finding suggests that risky online behavior may reflect weak practical application of digital literacy in everyday online interactions. The OECD's typology of digital risks emphasizes that children and adolescents face content, conduct, contact, and consumer risks in digital environments; therefore, the way adolescents behave online is central to understanding their vulnerability to harm (Youssef et al., 2025).

The finding is also consistent with research showing that digital literacy, parental mediation, and self-control are related to students' online risk. Purnama et al. found that digital literacy and parental mediation are important in explaining students' online risk during digital learning contexts (Purnama et al., 2021). The present study extends this evidence by positioning online risk behavior not merely as an outcome of digital exposure, but also as a behavioral risk factor that is negatively associated with digital literacy. This means that adolescents may have access to digital devices and social media, but without adequate literacy, they may still engage in unsafe online practices that increase their vulnerability.

The negative effect of digital literacy on cyberbullying vulnerability is one of the central findings of this study. Adolescents with higher digital literacy are less vulnerable to cyberbullying because they are better able to evaluate online interactions, recognize harmful content, protect privacy, manage digital identity, avoid unsafe communication, and respond appropriately to online threats. This finding is consistent with Tao et al., who found that digital literacy plays an important role in the relationship between digital technology use and cyberbullying experiences among children (Tao et al., 2022). The finding also reinforces the view that digital literacy should not be limited to technical skills, but should include critical, ethical, social, and safety-related competencies.

This finding directly addresses an important conceptual issue raised in the review process: when the dependent variable is cyberbullying vulnerability, the theoretically expected direction of digital literacy should be negative. The present results confirm that higher digital literacy is associated with lower cyberbullying vulnerability. This strengthens the internal consistency of the revised model and avoids the interpretive ambiguity that may arise when protective variables are reported as increasing

vulnerability. In this study, digital literacy clearly functions as a protective competence that reduces adolescents' susceptibility to cyberbullying.

The negative effect of democratic parenting on cyberbullying vulnerability further supports the role of family-based protection in adolescents' digital safety. Adolescents who experience democratic parenting may be more likely to seek help, report harmful online experiences, regulate emotional responses, and avoid escalating digital conflict. This is consistent with previous research indicating that parenting styles can serve as protective or risk factors for traditional bullying and cyberbullying victimization, depending on the quality of warmth, supervision, communication, and control within the family (Grama et al., 2024). In the present model, democratic parenting reduces cyberbullying vulnerability both directly and indirectly, showing that family relationships remain relevant even when adolescent peer interaction increasingly occurs in digital spaces.

The positive effect of online risk behavior on cyberbullying vulnerability was the strongest direct predictor in the model. This finding indicates that adolescents who engage in risky online practices are more likely to experience cyberbullying vulnerability. This is theoretically plausible because behaviors such as accepting unknown contacts, sharing personal information, participating in hostile comment threads, and responding impulsively to online conflict may increase exposure to harmful digital interactions. Studies on adolescents' online risks have shown that online vulnerability is closely related to patterns of digital behavior, privacy practices, and interaction with unknown or unsafe online actors (Youssef et al., 2025). Thus, cyberbullying prevention should not focus only on reducing screen time, but also on changing the quality and safety of adolescents' online behavior.

The mediation analysis showed that digital literacy significantly mediated the relationship between democratic parenting and cyberbullying vulnerability. This finding means that democratic parenting reduces cyberbullying vulnerability partly by strengthening adolescents' digital literacy. In other words, family-based protection becomes more effective when it contributes to adolescents' ability to understand, evaluate, and manage digital risks. This partial mediation is important because it shows that democratic parenting has both a direct protective effect and an indirect effect through digital literacy. Theoretically, this finding supports the protective pathway perspective: family communication and rational supervision can be translated into digital competence, which then reduces vulnerability to online harm.

Digital literacy also mediated the relationship between online risk behavior and cyberbullying vulnerability. Although the indirect effect was smaller than the direct effect, the mediation remained significant. This indicates that online risk behavior increases cyberbullying vulnerability partly because it is associated with lower digital literacy. However, the stronger direct effect of online risk behavior suggests that risky online practices may expose adolescents to cyberbullying even when digital literacy is considered. This finding has important implications: improving digital literacy is necessary, but it may not be sufficient if adolescents continue to engage in high-risk online behaviors. Therefore, cyberbullying prevention programs should combine digital literacy education with behavioral risk reduction strategies.

Theoretically, this study contributes to cyberbullying literature by proposing and testing an integrated protective pathway model. Previous studies have often examined parenting, digital literacy, online risk, and cyberbullying separately. This study integrates these constructs into a single SEM-PLS model and demonstrates how democratic parenting, online risk behavior, and digital literacy jointly explain cyberbullying vulnerability. This responds to the need for a more comprehensive model that moves beyond a single-factor explanation of cyberbullying. The findings support the view that cyberbullying vulnerability is shaped by both protective and risk pathways: democratic parenting and digital literacy represent protective pathways, whereas online risk behavior represents a risk pathway.

The study also provides a methodological contribution by presenting a more complete SEM-PLS evaluation. The measurement model showed satisfactory reliability, convergent validity, and discriminant validity. The structural model showed adequate explanatory power, no multicollinearity

problem, acceptable model fit, significant direct and indirect effects, and positive Q^2 values. This comprehensive reporting strengthens the rigor of the findings and responds to reviewer concerns that SEM-PLS results should not be reported only through path coefficients and p-values. By including reliability, validity, R^2, f^2, SRMR, Q^2, direct effects, indirect effects, and total effects, the revised analysis provides a more transparent and internationally acceptable reporting standard.

Practically, the findings suggest that cyberbullying prevention should involve parents, schools, and counseling services. For parents, democratic parenting should be promoted through open communication, supportive monitoring, and responsibility-based digital guidance. Parents should not only restrict internet use, but also help adolescents understand privacy, online ethics, digital footprints, and safe responses to cyberbullying (Ma et al., 2026). For schools, digital literacy programs should be integrated into student development, guidance, and counseling activities. Such programs should include practical cases on online risk behavior, privacy protection, ethical communication, reporting mechanisms, and emotional regulation in digital conflict. For school counselors, the findings highlight the need to assess students' online risk behavior and digital literacy as part of cyberbullying prevention and intervention.

The findings also have implications for educational policy and school-based counseling programs. Cyberbullying prevention should not be treated only as a disciplinary matter after incidents occur. Instead, schools need preventive programs that combine digital citizenship education, parent engagement, peer support, and counseling services. Intervention programs should help students recognize cyberbullying, avoid risky online practices, seek help safely, and build responsible digital habits. Recent intervention research also emphasizes the importance of comprehensive approaches to reducing cyberbullying victimization and perpetration among adolescents (Kurnaz & Kocturk, 2025; Li et al., 2025). Therefore, schools should develop cyberbullying prevention policies that are proactive, educational, and collaborative.

Despite its contributions, this study has several limitations. First, the cross-sectional design limits the ability to infer long-term causal relationships among democratic parenting, online risk behavior, digital literacy, and cyberbullying vulnerability. Future studies may use longitudinal designs to examine how these variables develop over time. Second, the data were collected through self-report questionnaires, which may be influenced by social desirability or recall bias. Third, the sample was limited to students from three senior high schools in Baubau City, so the findings should be interpreted within this research context. Fourth, the study used stratified purposive sampling with proportional allocation, not full probability random sampling. Future research may involve broader geographic coverage and probability sampling to strengthen generalizability.

Future studies may also extend the model by including additional variables such as parental mediation, self-control, peer support, school climate, empathy, or bystander behavior (Elboj-Saso et al., 2024). These variables may help explain why some adolescents with adequate digital literacy still become vulnerable to cyberbullying. In addition, future research may compare different groups, such as victims, perpetrators, and bystanders, to provide a more differentiated understanding of cyberbullying dynamics. Qualitative or mixed-method studies may also be useful to explore adolescents' lived experiences of online risk, family communication, and cyberbullying prevention.

Overall, the findings confirm that adolescent cyberbullying vulnerability is best understood through a combination of family, behavioral, and digital competence factors. Democratic parenting strengthens digital literacy and reduces vulnerability, online risk behavior increases vulnerability, and digital literacy functions as a mediating protective competence. These findings support the revised title and conceptual model of this study: Protective Pathways against Adolescent Cyberbullying: Democratic Parenting, Online Risk Behavior, and the Mediating Role of Digital Literacy.

Conclusions

This study examined the protective pathways against adolescent cyberbullying by analyzing the relationships among democratic parenting, online risk behavior, digital literacy, and cyberbullying vulnerability. The findings provide empirical support for the proposed structural model, showing that cyberbullying vulnerability among adolescents is shaped by the interaction between family-based protection, risky online behavior, and digital competence. Democratic parenting was found to strengthen adolescents' digital literacy and reduce their vulnerability to cyberbullying, while online risk behavior was associated with lower digital literacy and higher cyberbullying vulnerability. Digital literacy also significantly reduced cyberbullying vulnerability, confirming its role as a protective competence in adolescents' digital lives. The mediation analysis further showed that digital literacy partially mediated the relationship between democratic parenting and cyberbullying vulnerability. This indicates that democratic parenting does not only provide direct protection against cyberbullying vulnerability, but also works indirectly by improving adolescents' ability to understand digital risks, evaluate online interactions, protect privacy, and respond responsibly to harmful digital situations. In addition, digital literacy partially mediated the relationship between online risk behavior and cyberbullying vulnerability. Although online risk behavior remained a strong direct predictor of cyberbullying vulnerability, the significant indirect effect suggests that inadequate digital literacy may help explain why adolescents who engage in risky online practices become more vulnerable to cyberbullying. These findings contribute to the cyberbullying literature by offering an integrated protective pathway model that combines democratic parenting as a family-based protective factor, online risk behavior as a digital behavioral risk factor, and digital literacy as a mediating protective competence. The study extends previous research by moving beyond a single-risk-factor explanation and showing that adolescent cyberbullying vulnerability should be understood through the combined influence of family environment, digital behavior, and digital literacy. The results also strengthen the theoretical argument that cyberbullying prevention requires not only reducing risky online behavior, but also building adolescents' digital competence through supportive family and school environments. Practically, the findings suggest that cyberbullying prevention programs should involve collaboration among parents, schools, and counseling services. Parents need to strengthen open communication, rational supervision, and responsibility-based digital guidance. Schools and counselors should develop digital literacy programs that address online ethics, privacy protection, digital footprints, safe communication, reporting mechanisms, and strategies for managing online conflict. Interventions should not only focus on limiting screen time, but also on reducing online risk behavior and strengthening adolescents' capacity to navigate digital environments safely and critically. Despite its contributions, this study has several limitations. The cross-sectional survey design does not allow long-term causal conclusions, and the use of self-report questionnaires may be affected by social desirability or recall bias. The sample was limited to senior high school students from three schools in Baubau City, and the sampling technique used stratified purposive sampling with proportional allocation rather than full probability random sampling. Therefore, future studies are encouraged to use longitudinal designs, broader geographical samples, and additional variables such as parental mediation, self-control, peer support, school climate, empathy, or bystander behavior. Future research may also compare victims, perpetrators, and bystanders to provide a more comprehensive understanding of adolescent cyberbullying dynamics. Overall, this study confirms that democratic parenting and digital literacy function as protective pathways against adolescent cyberbullying, whereas online risk behavior functions as a risk pathway. Digital literacy plays a central mediating role by linking family-based protection and online behavioral risk to cyberbullying vulnerability. These findings support the importance of strengthening digital literacy and democratic family communication as part of comprehensive efforts to protect adolescents from cyberbullying in the digital era.

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