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Psychological Preparedness as a Component of Adolescent Disaster Readiness: Evidence from Secondary School Students in Yogyakarta

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ABSTRACT

Introduction: Indonesia's recurrent exposure to earthquakes, floods, landslides, and volcanic eruptions places adolescents in schools under continuous disaster risk. Preparedness, however, is not built on technical knowledge alone. The ability to regulate emotions, maintain a sense of control, and act with confidence during emergencies may shape how students translate knowledge into action. Despite this, psychological preparedness is rarely examined as a distinct and measurable construct in large student populations, particularly in high-risk regions. As a result, the psychological dimension of readiness often remains secondary within school-based disaster programs. This study examined the levels of psychological preparedness and general disaster preparedness among junior and senior high school students in Yogyakarta and analyzed the relationship between the two constructs.

Method: A cross-sectional correlational design was applied. Of 760 invited students, 700 participated (response rate 92.1%) from five districts/cities. The Psychological Preparedness for Disaster Scale and the General Disaster Preparedness Scale were administered. Because the data were not normally distributed, Spearman's Rho was used to assess correlation. An adjusted linear regression model was then performed to evaluate whether psychological preparedness remained associated with general preparedness after accounting for educational level, age, and gender.

Result: Most students demonstrated moderate levels of psychological preparedness (67.0%) and general disaster preparedness (65.8%). Psychological preparedness showed a positive correlation with general preparedness ($r = 0.254$; 95% CI 0.17–0.33; $p < 0.001$), indicating a small-to-moderate association. After adjustment, psychological preparedness remained independently related to general preparedness ($\beta = 0.23$, $p < 0.001$; $R^2 = 0.14$). The magnitude of the association was modest, yet stable across demographic controls.

Conclusion: Psychological readiness appears to function as one meaningful layer within adolescent disaster preparedness rather than as a dominant driver of behavior. In high-risk school contexts such as Yogyakarta, strengthening emotional regulation, perceived coping capacity, and decision-making confidence may complement technical training. Disaster education, therefore, may benefit from integrating psychosocial skill development alongside drills and hazard knowledge, while maintaining coordination between schools, families, and local disaster management agencies. Longitudinal and intervention-based research is needed to determine whether enhancing psychological preparedness leads to sustained behavioral improvements over time.

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INTRODUCTION

Indonesia repeatedly faces earthquakes, floods, landslides, and volcanic eruptions, placing large segments of its population under continuous disaster risk, including junior and senior high school students (1,2). For adolescents who spend most of their time in school environments, disaster exposure is not an abstract possibility but a recurring reality. In such contexts, preparedness cannot rely solely on infrastructure improvement or hazard knowledge. Young people must also be able to remain composed, think clearly, and act decisively under stress (3).

A growing body of international research shows that psychological processes influence whether individuals translate awareness into protective behavior (4,5). Emotional regulation, perceived control, and self-efficacy shape how risks are interpreted and how responses are executed. Behavioral frameworks, including integrations of the Transtheoretical Model (TTM), Social Cognitive Theory (SCT), and Protection Motivation Theory (PMT), illustrate that intention alone is insufficient; confidence in one's ability to act and belief in response effectiveness play enabling roles in moving from intention to actual preparedness behavior (6).

These psychological dimensions may be particularly salient during adolescence. Cognitive–emotional development is still in progress, and this developmental stage is often marked by heightened sensitivity to stress and uncertainty (7,8). After disasters, adolescents may experience anxiety, confusion, or maladaptive coping patterns. If preparedness education focuses only on technical procedures, evacuation routes, hazard recognition, emergency kits, without strengthening emotional coping capacity, the behavioral outcome may remain fragile (9).

Empirical studies conducted at household and community levels further support the relevance of cognitive–emotional factors (10,11). For example, self-efficacy and response efficacy are associated with mitigation behaviors, though this relationship is moderated by contextual factors, social vulnerability, and resource access (12). Within educational settings, adolescents who report stronger perceived control and coping competence tend to engage more actively in drills, simulations, and hazard planning activities. These findings indicate that preparedness behavior is not merely a function of information exposure; it is also embedded in how students appraise and manage risk internally.

Intervention research provides additional insight. Programs such as Psychological First Aid (PFA) and structured psychoeducation modules demonstrate that psychosocial training can enhance coping competence and readiness (13). However, most of this evidence derives from adult or professional populations. Quantitative research that explicitly measures psychological preparedness among school students remains limited, particularly in disaster-prone regions. The Psychological Preparedness for Disaster Scale (PPDS), developed as a multidimensional instrument assessing emotional regulation, coping capacity, and anticipatory guidance, has shown acceptable psychometric performance in prior validation studies (Cronbach's α 0.78–0.92). This makes it a promising tool for examining psychological readiness more systematically among adolescents.

Even so, much of the existing literature treats psychological variables in isolation, self-efficacy here, risk perception there, rather than examining psychological preparedness as a coherent construct situated within broader disaster readiness. From the perspective of Social Cognitive Theory and Protection Motivation Theory, psychological processes operate as proximal determinants of behavior. They shape how risks are evaluated and how coping responses are initiated. Framing psychological preparedness as an integrated domain may therefore provide a clearer understanding of how internal capacities interact with external preparedness structures.

Despite widespread acknowledgment of the importance of psychological factors, empirical evidence from large student samples in high-risk settings remains sparse. In the Special Region of Yogyakarta (DIY), where seismic and volcanic hazards are recurrent, schools routinely conduct preparedness activities. Yet few quantitative studies have examined whether students' psychological readiness is associated with their broader disaster preparedness once demographic characteristics are taken into account. Without such evidence, efforts to integrate psychosocial components into school programs rest more on assumption than on data.

Against this background, the present study examines the relationship between psychological preparedness and general disaster preparedness among junior and senior high school students in DIY. The working hypothesis is that higher psychological preparedness is associated with higher general preparedness, while the null hypothesis assumes no significant association. By analyzing these variables within a large sample from a high-risk region, this study seeks to clarify whether psychological readiness functions as a meaningful component within adolescent disaster preparedness rather than as a peripheral characteristic.

METHOD

Research Type

This research applied a cross-sectional correlational design to examine the relationship between Psychological Preparedness for Disaster and General Disaster Preparedness among secondary school students. Both constructs were measured at a single point in time.

A cross-sectional approach was considered appropriate because the primary objective was to identify statistical associations rather than to establish causality. While correlation does not permit causal inference, it provides an initial empirical basis for understanding how psychological and behavioral dimensions of preparedness coexist within the same population (14). The findings are therefore interpreted strictly within associative boundaries.

Population and Sample

The target population consisted of junior and senior high school students in the Special Region of Yogyakarta (DIY), an area classified as high risk in the Indonesian Disaster Risk Index (IRBI) 2022.

Out of 760 invited students, 700 agreed to participate, resulting in a response rate of 92.1%. Sixty students did not participate due to absence during data collection or failure to return parental consent forms. No replacement sampling was undertaken.

Students were selected using simple random sampling within each participating school. Official student lists served as the sampling frame. Each student was assigned a numerical code and selected using a computer-generated randomization procedure. This approach was intended to minimize selection bias at the individual level.

School Criteria

Ten schools (two per district/city) were included to capture variation in hazard exposure across the region. Selection criteria included:

School type (public and private).

Geographic location (urban and rural).

Administrative distribution across Sleman, Bantul, Kulon Progo, Gunungkidul, and Yogyakarta City.

These areas differ in dominant hazard profiles, including earthquakes, floods, landslides, and drought. Schools were selected purposively based on hazard-prone classifications provided by local disaster authorities.

Because schools were selected purposively while students were randomly sampled within schools, the data structure was hierarchically clustered (students nested within schools). Such clustering can introduce intra-class correlation (ICC), potentially affecting the assumption of independent observations. ICC values were therefore estimated for both primary outcome variables. The coefficients were low (ICC < 0.05 for PPDS and GDPS), indicating minimal between-school variance. For this reason, single-level analyses were retained, although clustering is acknowledged when interpreting statistical precision.

Inclusion and Exclusion Criteria

Inclusion criteria:

Students enrolled in Grades VII–XII;

Active registration in 2024/2025 academic year;

Willing to participate, with parental consent for those under 18.

Exclusion criteria:

Students absent during data collection;

Students with medical or psychological conditions preventing questionnaire participation.

Questionnaires with more than 10% missing data.

Research Instruments

Two primary instruments were administered, each using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). A third instrument was pre-tested but not included in the final analysis.

Psychological Preparedness for Disaster Scale (29 items)

This scale assesses cognitive–emotional readiness, including coping capacity, anticipatory guidance, and emotional regulation.

Score range: 29–145.

Categorical cutoffs (low, moderate, high) were derived from tertile distributions during pilot testing to aid descriptive interpretation. However, inferential analyses used continuous scores to preserve statistical sensitivity and reduce classification bias.

Pilot testing (N = 100) demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.764$).

Item–total correlations ranged from 0.32–0.67.

Skewness (–0.41) and kurtosis (0.38) were within acceptable limits for ordinal data.

Exploratory Factor Analysis supported a three-factor structure aligned with the original conceptual dimensions (KMO = 0.81; Bartlett's test $p < 0.001$).

General Disaster Preparedness Scale (36 items)

This instrument evaluates preparedness across knowledge, attitudes, and behavioral actions.

Score range: 36–180.

Categorical levels were reported descriptively, while statistical analyses relied on continuous scoring.

Item–total correlations ranged from 0.28–0.61.

Distribution indicators showed acceptable skewness (–0.32) and kurtosis (0.27).

Disaster Mitigation Awareness Scale

This 37-item instrument (34 valid items; $\alpha = 0.838$) was piloted but excluded from the final analysis because the primary objective centered on the relationship between psychological preparedness and general preparedness.

Instrument Development and Validation

All instruments were adapted from previously validated tools with formal permission from original developers. Modifications were made to ensure linguistic and contextual relevance for students in Yogyakarta.

Content validity was established through consultation with two academic experts in disaster studies (PhD level) and one senior practitioner from the Regional Disaster Management Agency (BPBD DIY) with over ten years of field experience.

A pilot study involving 150 students from schools with comparable characteristics was conducted. Validity testing used item–total correlations (r-table = 0.159; $\alpha = 0.05$). Results were as follows:

General Disaster Preparedness Scale: 36 valid items from 38 tested; $\alpha = 0.714$

Psychological Preparedness for Disaster Threat Scale: 29 valid items from 32 tested; $\alpha = 0.764$

Disaster Mitigation Awareness Scale: 34 valid items from 37 tested; $\alpha = 0.838$

All instruments met acceptable reliability thresholds and were deemed suitable for the main study.

Sample Size

A priori power analysis (G*Power 3.1) was conducted for correlational testing ($\alpha = 0.05$, power = 80%, expected effect size r = 0.20–0.25). The minimum required sample was 317 participants. The final sample of 700 exceeded this threshold substantially, allowing greater stability of estimates and enabling subgroup analyses.

Data Collection Procedures

The study was conducted between 15 June and November 2024, with questionnaire administration occurring from 20 June to 30 September 2024.

Before data collection, researchers explained the study objectives and procedures to school administrators, teachers, and students. Questionnaires were completed in supervised classroom settings. Trained assistants were present to clarify procedural questions but did not influence responses. Completed questionnaires were checked onsite to minimize missing data.

Data Analysis

Data were analyzed using IBM SPSS version 26. Normality was assessed using the Kolmogorov–Smirnov test. Both PPDS (K–S = 0.089, $p < 0.001$) and GDPS (K–S = 0.074, $p < 0.001$) deviated from normal distribution.

Given the ordinal nature of Likert-scale data and non-normal distribution, Spearman's Rho was used to examine correlation. Monotonicity assumptions were verified (rs monotonicity test $p < 0.001$). This approach aligns with statistical practices commonly applied in disaster preparedness research involving similar data structures (15)..

Missing Data Handling

Cases with more than 10% missing responses were excluded (n = 14). For remaining cases (<2% missing at item level), median imputation was applied due to the ordinal nature of the scales. The proportion of imputed responses per scale was minimal (<1.5% of total data points).

To evaluate potential bias, sensitivity analyses compared complete-case and imputed datasets. Correlation coefficients differed by less than 0.01 ($\Delta r < 0.01$), indicating that imputation did not materially alter the findings.

Informed Consent and Ethical Prosedures

Students aged 18 years and older provided written informed consent. Those under 18 completed assent forms, accompanied by parental consent. Participant anonymity was maintained using coded identifiers, and data were stored securely.

Ethical approval

Ethical approval was obtained from the Ethics Committee of Universitas Jenderal Achmad Yani Yogyakarta (No. Skep/225/KEP/VI/2024). All procedures adhered to WHO ethical standards and national regulations concerning research involving minors (16).

RESULTS

A total of 700 junior and senior high school students from the Special Region of Yogyakarta completed the survey. Participants were drawn from five administrative areas; Sleman, Bantul, Kulon Progo, Gunungkidul, and Yogyakarta City, each with distinct hazard profiles and levels of exposure. Table 1 summarizes respondent characteristics.

Table 1. Characteristics of Respondents (N = 700)

Characteristics	n	%
Gender		
Female	443	63.3
Male	257	36.7
Education level		
Junior high	368	52.6
Senior high	332	47.4
Age group		
12–14 years	289	41.3
15–17 years	344	49.1
≥18 years	67	9.6
Experience Facing Disaster		
Earthquake	522	69.1
Tornado	26	3.7
Volcanic eruption	126	16.7
Landslide	10	1.3
Flood	14	1.9

Source: Primary Data, 2024.

Most respondents were female (63.3%). More than half were junior high school students (52.6%), and nearly half were between 15–17 years of age (49.1%). Earthquakes were by far the most frequently experienced disaster (69.1%), reflecting the region's seismic vulnerability. Exposure to volcanic eruptions (16.7%) was also notable given the proximity to Mount Merapi. Other hazards; tornadoes, floods, and landslides, were reported far less frequently.

This pattern of exposure is not incidental. Recurrent contact with earthquakes and volcanic activity forms the lived background of many adolescents in Yogyakarta. Yet exposure alone does not guarantee preparedness; it simply provides the experiential context within which preparedness develops, or fails to develop.

Psychological Preparedness for Disaster

Table 2. Psychological Preparedness for Disaster (N = 700)

Category	**n**	**%**	**Score Distribution**		
			Mean ± SD	**Median**	**Min–Max**
Low	102	13.8	95.3 ± 12.8	92.0 (IQR = 14.0)	61–134
Moderate	506	67.0			
High	92	12.2			
Total	**700**	**100**			

Source: Primary Data, 2024

Most students fell into the moderate category of psychological preparedness (67.0%), with 13.8% categorized as low and 12.2% as high. The overall mean score was 95.3 (SD = 12.8), with a median of 92.0 (IQR = 14.0). Scores ranged from 61 to 134.

General Disaster Preparedness

Table 3. General Disaster Preparedness (N = 700)

Category	**n**	**%**	**Score distribution**		
			Mean ± SD	**Median**	**Min–Max**
Low	113	15.0	107.6 ± 15.2	104.0 (IQR = 18.0)	76–152
Moderate	497	65.8			
High	90	11.9			

Source: Primary Data, 2024

A similar distribution emerged for general disaster preparedness. Most students were again classified as moderate (65.8%), while 15.0% fell into the low category and 11.9% into the high category. The mean score was 107.6 (SD = 15.2), with a median of 104.0 (IQR = 18.0) and a range of 76–152.

Subgroup Analysis Junior vs Senior High School Students

To examine differences by educational level, median scores were compared using the Mann–Whitney U test due to non-normal score distributions.

Descriptive Comparison

Psychological Preparedness (PPDS)

Junior high: Median = **90** (IQR = **13)**

Senior high: Median = **94** (IQR = **15)**

General Disaster Preparedness (GDPS)
Junior high: Median = **102** (IQR = **17)**
Senior high: Median = **106** (IQR = **19)**

Inferential Analysis

Statistical testing revealed significant differences between junior and senior high school students for both measures. Effect sizes were calculated using both r ($z/\sqrt{N}$) and rank-biserial correlation to provide a stable estimate of magnitude in a large sample.

Table 4. Mann–Whitney U Test for Junior vs Senior High Students

Variable	U	z	p-value	Effect size r	95% CI (r)	Rank-biserial	Interpretation
Psychological Preparedness (PPDS)	11,885	–18.42	<0.001	0.22	0.18–0.26	0.29	Small–moderate
General Disaster Preparedness (GDPS)	14,908	–17.29	<0.001	0.21	0.17–0.25	0.27	Small–moderate

Source: Primary Data, 2024

Effect sizes fell within the small-to-moderate range (r = 0.21–0.22; rank-biserial = 0.27–0.29). In practical terms, this indicates that roughly one quarter of the rank variance favored senior students. The direction is developmentally plausible: older students appear somewhat more prepared. Still, the magnitude does not justify claims of a sharp educational divide. The progression is present, but gradual.

This nuance matters. While schooling level is associated with preparedness, it is unlikely to be the primary driver. Development alone does not automatically translate into strong readiness.

Overall Preparedness Profile

Both variables demonstrate a predominance of moderate preparedness, suggesting foundational readiness but insufficient optimization. This pattern indicates that frequent disaster exposure does not necessarily translate to stronger preparedness without structured psychosocial reinforcement.

Normality Test and Correlation Analysis

The Kolmogorov–Smirnov test indicated non-normal distribution for both variables; therefore, Spearman's Rho was used.

Table 5. Correlation Between Psychological Preparedness and General Disaster Preparedness

Variable	r	p-value	95% CI
General Disaster Preparedness	0.254**	<0.001	0.17–0.33

Source: Primary Data, 2024

A positive correlation emerged between psychological preparedness and general disaster preparedness (r = 0.254, $p < 0.001$; 95% CI 0.17–0.33). The association falls within the small-to-moderate range. It is statistically robust, yet not overwhelming.

Empirically, this indicates that students who report stronger emotional regulation, confidence, and perceived control also tend to report higher levels of disaster readiness behaviors. The relationship is meaningful, but it does not suggest equivalence between the constructs. Psychological readiness appears to support general preparedness, rather than fully determine it.

Adjusted Model Results

Table 6. Adjusted Regression Model Predicting General Disaster Preparedness

Predictor	β (Standardized)	p-value
Psychological Preparedness	0.23	<0.001
Educational Level	0.18	<0.001
Age	0.06	0.072
Gender	0.04	0.118

Model $R^2 = 0.14$

An adjusted linear regression model was conducted to examine whether the association persisted after accounting for educational level, age, and gender.

Psychological preparedness remained a significant predictor ($\beta = 0.23$, $p < 0.001$). Educational level was also significant ($\beta = 0.18$, $p < 0.001$), whereas age ($p = 0.072$) and gender ($p = 0.118$) were not statistically significant predictors. The overall model explained 14% of the variance ($R^2 = 0.14$).

Notably, the standardized coefficient for psychological preparedness was only slightly reduced compared to the bivariate correlation. This indicates limited confounding by demographic variables. In practical terms, psychological readiness retains explanatory value even when schooling level and age are taken into account.

At the same time, the modest R^2 reminds us that preparedness is multidimensional. Psychological factors matter, but they operate alongside structural, educational, familial, and institutional influences.

Overall Preparedness Profile

Across analyses, one pattern recurs: moderate predominance. Most students occupy the middle ground, neither unprepared nor highly resilient. Frequent disaster exposure in Yogyakarta does not automatically yield high preparedness. Experience alone appears insufficient without structured reinforcement.

The data point toward a layered understanding of readiness. Psychological preparedness contributes meaningfully, yet it functions as one element within a broader system. Strengthening adolescent disaster readiness, therefore, likely requires more than information campaigns; it requires intentional psychosocial cultivation embedded within school environments. Preparedness, in this setting, is not absent. But it is still in formation.

DISCUSSION

This study observed that both psychological preparedness and general disaster preparedness among students were predominantly moderate, with a statistically significant but modest correlation between the two ($r = 0.254$, $p < 0.001$). The pattern is revealing. Disaster readiness among adolescents does not appear to rest on technical knowledge alone. Emotional regulation, self-confidence, and perceived control are involved**,** but their influence is supportive rather than dominant.

The strength of the association indicates that psychological readiness operates as a complementary factor in shaping preparedness behavior (17). It matters. Yet it does not eclipse structural, educational, or environmental influences. In practical terms, psychological preparedness seems to function as part of the readiness ecosystem rather than as its central engine.

Importantly, the present findings situate psychological preparedness within an adolescent population in a high-risk educational context. Much of the empirical literature has concentrated on adults, professionals, or healthcare workers. By contrast, secondary school students, despite being routinely exposed to hazards, have received comparatively limited quantitative attention. Within this setting, psychological preparedness emerges as an observable and modelable dimension of disaster readiness. This resonates with recent validation studies and theoretical work identifying psychological preparedness as a measurable construct relevant to disaster response (3,18).

Interpretation in Context

The small-to-moderate correlation requires careful interpretation. Psychological readiness is clearly relevant, but it is unlikely to be the primary determinant of preparedness behavior. In a region like Yogyakarta, where exposure to earthquakes and volcanic eruptions is recurrent, multiple forces shape how students prepare. School infrastructure, access to resources, family preparedness culture, prior exposure experiences, and peer norms may exert stronger behavioral influence than psychological traits alone.

Comparable patterns have been documented in Indonesian adolescent health behavior research, where intention and perceived control predict behavior but remain embedded within broader social capital structures (19) Preparedness appears to follow a similar logic. Motivation and confidence help, yet they operate within a social and institutional framework.

Measurement factors should also be acknowledged. Both constructs were assessed through self-report instruments. While reliable, such measures can compress variability and underestimate, or occasionally inflate, true associations. Moreover, repeated disaster exposure does not automatically cultivate deeper psychological competencies (20). Students may become familiar with procedures without strengthening internal coping capacities. This may explain why the "high preparedness" category remained relatively small despite substantial hazard exposure.

Systematic reviews of school-based disaster interventions similarly emphasize that psychosocial components are essential for sustained behavioral outcomes (21). Technical drills alone are insufficient. Preparedness training that neglects emotional and cognitive dimensions risks producing procedural familiarity without adaptive resilience.

Subgroup analysis adds further nuance. Senior high school students demonstrated significantly higher preparedness scores than junior high students, although effect sizes were small to moderate. The difference is statistically robust yet developmentally gradual. Older students may possess more advanced anticipatory reasoning, emotional regulation, and decision-making skills, traits associated with middle-to-late adolescence. However, the cross-sectional design does not allow conclusions about interaction or moderation effects. Educational level was not formally tested as a moderator within regression models. Thus, subgroup differences should not be interpreted as evidence that age amplifies or weakens the psychological–behavioral relationship. At this stage, they are hypothesis-generating rather than confirmatory.

Comparison With Previous Studies

The present findings sit comfortably within the broader preparedness literature. Research developing psychological preparedness scales, for example in fire or wildfire contexts, demonstrates that psychological readiness is measurable and linked to adaptive responses, although its effect size often diminishes when structural resources and prior experience are included. Similar patterns have been observed in professional and community populations, where self-efficacy and psychosocial competence consistently predict preparedness but rarely operate in isolation (22,23).

Extending this line of inquiry to adolescents is important. Young people occupy a developmental phase characterized by evolving autonomy, emotional regulation, and risk appraisal (18,24). They are neither passive recipients of disaster response nor fully independent actors. Their preparedness is shaped by both internal competencies and external guidance.

Developmental disaster psychology literature notes that older adolescents generally demonstrate stronger anticipatory reasoning and self-regulation compared to early adolescents. The higher median scores observed among senior high school students are therefore plausible. Still, causality cannot be inferred. Age-related cognitive maturation may facilitate preparedness, but without longitudinal data, this remains interpretive rather than definitive.

Empirically, the findings indicate that psychological preparedness can be incorporated into multivariable models of adolescent disaster readiness in a high-risk region. It does not dissolve into demographic noise. At the same time, it explains only part of the behavioral variance, reinforcing the need for integrative frameworks.

Plausible Psychological Mechanisms

Several plausible mechanisms may explain how psychological preparedness influences preparedness behavior:

Self-efficacy encourages initiative to perform practical preparatory actions (25,26);

Emotional regulation enables rapid and non-panic decision-making during threats (10,11,27);

Perceived control motivates planning and participation in mitigation drills (28,29).

These pathways are supported by psychosocial intervention studies showing that psychoeducation and Psychological First Aid (PFA) enhance competencies relevant to disaster contexts (24,30). Most evidence, however, originates from adult or healthcare populations. Extrapolation to adolescents should therefore be cautious.

Interestingly, the orientation toward preparedness reflected here also parallels classical Islamic nursing ethics, particularly the principles of amanah (moral responsibility) and rahmah (compassionate responsiveness) (31). While not directly measured, such value-based orientations may shape how readiness is internalized within culturally embedded educational systems.

Practical Implications

Preparedness education in Yogyakarta schools would likely benefit from integrating psychosocial training with technical instruction. The modest effect size observed here implies that strengthening psychological preparedness alone will not dramatically transform behavior. Skill-building must be accompanied by environmental reinforcement, repeated drills, and institutional clarity.

One practical question deserves attention: what constitutes a "minimum effective dose" of psychological training? How much improvement in self-efficacy or emotional regulation translates into measurable behavioral change? This remains empirically underexplored.

Multi-component interventions, especially those incorporating experiential simulations, scenario-based decision-making, and structured reflection, may yield stronger outcomes than information delivery alone (21). Moreover, the developmental gradient observed between junior and senior students suggests that age-tailored strategies are warranted. Younger adolescents may benefit from structured emotional regulation exercises and guided rehearsal, whereas older students may respond better to autonomy-supportive, problem-solving–oriented modules.

Limitations

Several limitations must temper interpretation. The cross-sectional design precludes causal inference; the direction of association cannot be determined. Self-report measures introduce the possibility of social desirability and recall bias. Schools participated voluntarily, raising the possibility of selection bias if participating institutions differ systematically in preparedness culture.

Information bias regarding disaster experience cannot be excluded. Although the sample size was substantial and drawn from five districts, generalization beyond Yogyakarta should be cautious given Indonesia's diverse hazard profiles and school systems. Finally, unmeasured confounders, such as family preparedness practices, enforcement of school safety policies, or prior trauma exposure, may influence the observed association.

The modest R^2 (0.14) further underscores that much of the variance in preparedness remains unexplained. Psychological readiness is one piece of the puzzle, not the entire framework.

Recommendations for Future Research

Future studies should move beyond cross-sectional associations. Longitudinal or quasi-experimental designs are needed to determine whether enhancing psychological preparedness produces measurable improvements over time. Multidimensional instruments could disentangle self-efficacy, emotional regulation, risk perception, and social support, enabling mediation and moderation analyses.

Explicit testing of interaction effects, through cross-product terms in regression models, would clarify whether educational level or age modifies the relationship between psychological and general preparedness. Behavioral outcomes should also be prioritized: participation in evacuation drills, development of family emergency plans, or completion of emergency kits provide stronger endpoints than perception-based scores alone.

Randomized or cluster-based school trials integrating psychosocial and technical modules would allow evaluation of synergistic effects. Qualitative inquiry may further illuminate contextual barriers and culturally grounded facilitators of preparedness practice.

In short, adolescent disaster readiness appears layered. Psychological preparedness is not peripheral, yet neither is it decisive on its own. Understanding how it interacts with structural and developmental forces remains the next critical step.

CONCLUSION

Psychological and general disaster preparedness among students in Yogyakarta were mostly at moderate levels, and although the association between them was statistically significant, its magnitude was limited. Psychological attributes, particularly perceived control, emotional stability, and self-confidence, clearly relate to preparedness behavior. However, they explain only part of the picture.

Older students showed higher preparedness scores than younger ones, reflecting a gradual developmental shift rather than a categorical difference between school levels. Disaster readiness in adolescence, therefore, cannot be reduced to knowledge acquisition alone; psychosocial capacity and contextual support appear equally important.

Future studies need to move beyond cross-sectional designs and examine whether strengthening psychological competencies actually produces sustained behavioral change. Incorporating contextual influences, such as family preparedness, prior trauma exposure, and school climate, would help clarify how preparedness develops over time.

AUTHOR CONTRIBUTION STATEMENT

NN conceptualized the study design, conducted data analysis, and prepared the initial manuscript draft. RWH contributed to data collection, data verification, and manuscript review. IWWS assisted in statistical analysis and interpretation. All authors critically reviewed, revised, and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

CONFLICT OF INTEREST

The authors confirm that there are no conflicts of interest that might have affected the impartiality or integrity of this study.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

In developing this manuscript, the authors relied solely on conventional language-editing tools, such as spellcheckers and grammar checkers, along with informal discussions of ideas. No essential elements of the study design, data analysis, interpretation, or conclusions were produced by artificial intelligence technologies. All scientific content, interpretations, and writing were independently conducted by the authors.

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