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Beyond Personal Factor: A Multilevel Analysis for Predicting the Effect of Moral Self-regulation and School Climate on Muslim Adolescent Aggressivity

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Abstract

Aggressive behaviors among adolescents have been increasingly observed in Indonesian Islamic boarding schools (pesantren), garnering significant attention due to their incongruity with the schools' ethos. Addressing these behaviors in pesantren requires a different approach from mainstream schools due to their unique characteristics. This study investigates the impact of moral self-regulation and school climate on aggressiveness among Muslim adolescents, using a multilevel analysis that considers both individual and institutional factors within the educational setting as units of analysis. This quantitative study involved 428 participants (mean=16.45, SD=1.01) both males and females from ten pesantren in three provinces in Indonesia selected using convenience sampling. Data were collected using the modified version of the aggressivity scale, moral self-regulation scale, and school climate scale. They were analyzed using multilevel regression analysis techniques with the aid of the R lmerTest program. An initial evaluation of the need for multilevel analysis was done by checking the significance of the Likelihood Ratio Test (LRT) results for the Intercept models and Intraclass correlation (ICC) above 5%. LRT and Akaike Information Criterion (AIC) were used as the selection criteria for the best hierarchical models involving random intercepts and random slopes. The study found that better moral self-regulation in students significantly reduces adolescent aggressivity. Additionally, a positive school climate helps prevent aggressive behavior among students. Addressing aggression in Muslim adolescents in Indonesia requires focusing on both individual and school factors that promote positive behavior, emphasizing the importance of moral self-regulation and a supportive school environment.

INTRODUCTION

Lately, there has been a lot of news about acts of aggression committed by teenagers in Indonesian Islamic boarding schools (*pesantren*) (BBC News Indonesia, 2022; Berita Indonesia News, 2023; Indonesian Child Protection Commission [KPAI], 2023; Zuhriya, 2021). Aggressivity is a behavior that causes harm to another individual (Buss & Perry, 1992). Similarly, Baron and Richardson (1994) described aggressivity as a form of intentional harmful behavior by individuals towards other living creatures. Some recent news of aggressive acts

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that happened in Islamic boarding schools resulted in the death of the victims (Anissa, 2023; Majid, 2023; Pratama, 2023; Ridha & Anwari, 2023). The news has attracted public attention because Islamic boarding schools, known as pesantren, have long been considered as educational institutions that play a pivotal role in instilling moral and religious values in students (Tabroni et al., 2022). The moral and religious education provided in *pesantren* has long been seen as a solution to the problems of moral degradation (Solihin et al., 2020).

Transitioning to boarding schools can be challenging for some students and cause some issues including aggressive responses. In their longitudinal study, Mander and Lester (2017) discovered that while depression, anxiety, and emotional/behavioral problems increased similarly in boarding and non-boarding students over time, boarding students experienced much higher levels of stress and anxiety when they moved into middle school as opposed to their non-boarding peers. The authors argue that certain children's mental health problems may worsen in boarding school environments because of their separation from their families and the need to adjust to new environments. Research conducted by Kamila and Hasanah (2023) reports that students in Islamic boarding schools can face various psychological problems which can manifest as aggression, as a result of the busy daily schedule which starts from early morning until late at night, as well as academic and moral expectations. Furthermore, the small, insular nature of boarding school communities can exacerbate social difficulties and conflicts, potentially leading to bullying, victimization, and aggressive responses (Mander et al., 2015; Mander & Lester, 2017).

To be successful in facing the challenges, adolescents living in Islamic boarding schools are required to have good self-regulation (Yuhbaba et al., 2022). Baumeister and Vohs (2004) explain that self-regulation is an individual's ability to regulate their own behavior, which can increase the flexibility and adaptability of human behavior so that they can control their behavior to a greater extent than social and situational demands. Self-regulation has a positive impact on individuals and groups, and good self-control plays an important role in achieving desired outcomes, including task achievement, success in educational institutions and the workplace, mental health, and adjustment and social interactions. Research on self-regulation is heavily influenced by cybernetic theory, which explains how individuals can regulate themselves by making adjustments according to set goals or standards. In this context, moral self-regulation is self-regulation by individuals regarding moral standards.

Encouraging the implementation of moral self-regulation is important because this has implications for the frequency of incidents of violence and aggressive acts. Moral self-regulation helps adolescents in Islamic boarding schools to manage emotions and stress well, so they can deal with challenges and pressures more effectively and avoid aggressiveness (Yu & Li, 2019; Yuhbaba et al., 2022). Moral self-regulation also helps adolescents to regulate emotions and behavior in social interactions (Yu & Li, 2019). Thus, they can develop healthy interpersonal relationships and build positive connections with fellow students and *pesantren* teachers.

Besides personal factors, environmental factors could also influence aggressive behavior in boarding school students, for example, school climate (Elmasry et al., 2016; Ivaniushina & Alexandrov, 2022; Prati et al., 2018). According to Gage et al. (2014), school climate is the quality and character of the school's social environment which provides opportunities to shape school norms, values, rules and structures. A positive school climate, or a safe school (emotionally and physically), involves collaboration between teachers, students and parents.

According to a study by Ivaniushina and Alexandrov (2022) in Russia, schools with fair and transparent disciplinary policies had lower rates of peer violence. According to a multilevel analysis research carried out in Italy by Prati et al. (2018), schools with higher rates of violent behavior had a larger negative correlation between students' aggressive behavior and a feeling of community. This implies that encouraging a strong sense of community and good

connections between students and staff may be especially crucial in boarding school situations to reduce violent tendencies.

While previous studies have provided valuable insights into understanding the impact of self-regulation and school climate on aggressivity, certain limitations are present. First, there are limited studies on aggressivity in the context of specific cultural or regional settings such as Indonesian Islamic boarding schools. Islamic boarding schools, also known as *pesantren*, possess distinct features and dynamics that differentiate them from other educational institutions. Thus, research on self-regulation, school climate, and aggressiveness in Islamic boarding schools is a relevant and important topic to be explored further.

Second, this study is among the limited studies that explore the interplay between individual-level and community-level factors by examining the effect of predictor at student-level and predictor at school-level for the naturally nested data. More specifically, this study investigates the influence of self-regulation (individual-level) and school climate (community-level) on aggressive behaviors among Muslim adolescents.

This study means to address the existing research gaps related to the impact of self-regulation and school climate on aggressivity through the following ways. First, we focus on specific populations that are students of Islamic boarding schools in which the schools have a homogenous nature. Islamic boarding schools typically have a relatively homogeneous population of students with similar religious backgrounds and experiences. This can reduce potential confounding variables and enhance the internal validity of the study.

Second, we take into account the nature of nested data and estimate separately the effect of individual level predictor and community level predictor in the expression and management of aggressivity. Third, findings from research in Indonesian Islamic boarding schools may contribute to the broader understanding of how religious education and communal living influence aggression in other religious educational institutions or cultural settings.

Rationale of the study

Moral self-regulation plays a crucial role in influencing aggressiveness, particularly through its association with moral disengagement. Studies have shown that moral self-regulation involves a dynamic interplay of cognitive, affective, and social influences, impacting behaviors such as prosocial intentions and compliance with moral standards (Jiang et al., 2017; Kaplan, 2017). Moral disengagement, a key aspect of moral self-regulation, has been linked to aggressive behavior in children and adolescents (Gini, 2006; Gini et al., 2014).

Research suggests that moral disengagement can lead individuals to separate moral standards from their actual behavior, thereby weakening their moral self-regulation mechanisms and potentially increasing aggressive tendencies (Pan et al., 2009). Furthermore, moral disengagement has been associated with transgressive behavior and reduced self-regulatory efficacy, which may contribute to increased aggressiveness (Gini, 2006).

Studies have explored that moral disengagement has been identified as a mechanism that can deactivate moral standards and self-sanctions, leading to inhumane behavior without feelings of remorse or guilt, which can contribute to aggressiveness (Thornberg et al., 2020). The selective deactivation of moral standards and self-deception in pursuit of self-interests, as seen in moral disengagement, may further exacerbate tendencies toward aggression and violence (Caprara et al., 2014).

The other factor that significantly influences the behavior of adolescents living in boarding schools, particularly in relation to aggressiveness, is the school climate. Wang and Dishion (2012) found that perceptions of school climate decline while behavioral problems and deviant peer affiliation increase, indicating a potential link between negative school climate and behavioral issues. Zhang et al. (2021) highlighted the indirect effect of school climate on bullying victimization and aggressive behavior, mediated by concerns about reporting bullying

incidents. Espelage et al. (2014) emphasized the impact of school climate on aggression, peer victimization, and bully perpetration, underscoring the importance of understanding and addressing school climate to mitigate aggressive behaviors among adolescents in boarding schools. These studies collectively suggest that fostering a positive school climate is crucial for promoting prosocial behaviors and reducing aggressiveness in adolescents residing in boarding school environments.

Test for the significance of parameters

In multilevel models, tests for multiple parameters, fixed effects, random effects, or a mix of both fixed and random effects can be done using Likelihood Ratio Test (LRT). The likelihood ratio test compares the deviance (-2 log-likelihood) of two models, the model with less number of parameters and the model with more parameters. In this study, the models tested using LRT are:

Model 1 : Empty model with fixed-intercept
Model 2 : Empty model with random-intercept
Model 3 : Model with random intercept and a fixed-predictor level 1 (moral self-regulation)
Model 4 : Model with random intercept, a fixed-predictor level 1 (moral self-regulation), and a fixed-predictor level 2 (school climate)
Model 5 : Model with random intercept and random slopes of moral self regulation.

METHODS

Design

This study used a quantitative approach with a correlational method (Burkholder et al., 2019) to achieve the research goal namely examining the relationship between moral self-regulation, school climate, and aggressivity of adolescents. Specifically, the statistical analysis use multilevel analysis for accounting the variation between schools and between students simultaneously (Snijders & Bosker, 2012).

Participants

The population of this study is adolescents living in Islamic boarding schools in Java Island, Indonesia. The obtained sample of this study is from ten Islamic boarding schools (*pesantren*) in three provinces in Indonesia, namely Banten, Jakarta, and Central Java province. The participants was collected cross-sectionally at a one-time point. They were sampled using a purposive sampling technique and participants were assessed for eligibility using inclusion and exclusion criteria. The inclusion criteria were a) adolescents studying at a senior high school level, b) must be within the age range of 15 to 18, c) living in an Islamic boarding school full day long, d) must be permitted by the teacher guardian. Thereafter, 551 high school adolescents participated in this study by filling out questionnaire papers.

Instrumentation

Aggressivity

Aggressivity served as the dependent variable and the instrument used to collect data about aggressivity was adapted and modified from the aggression questionnaire scale developed by Buss and Perry (1992). The original aggression questionnaire has a satisfactory reliability ($\alpha = .87$) (Naseer & Husain, 2020). The modification was done so that it relevants to the subject targets who are adolescents living in Islamic boarding schools. The instrument contained 24 statement items. The instrument assessment is a Likert scale, with clear statements with five answer options (1 = strongly disagree to 4 = strongly agree). One example of the items was

"*Saya sering terlibat perkelahian di pesantren.*" The validity of this instrument is evaluated using Confirmatory Factor Analysis (CFA). The CFA results show that the model fit with RMSEA= .058, CFI= .967, and TLI= .957. Two items are not valid due to the non-significance of the t-test and due to the negative coefficient. Thus items number 13 and 20 were dropped and not included for further analysis. This study uses data from factor scores of all variables that were obtained from the CFA results. The factor scores are converted to T-scores using the formula of $50 + 10 * factorscores$ to eliminate negative scores.

Moral Self-regulation

Moral self-regulation served as the Level 1 (individual level) independent variable. Authors developed an instrument to measure self-regulation for students in Islamic boarding schools based on Baumeister and Vohs (2004) definition of self-regulation. The instrument contains 20 statements with a combination of favorable and unfavorable items with Likert scale options ranging from 1 (strongly disagree) to 4 (strongly agree). One sample item asked to respondents was "*Saya tidak membalas meskipun diejek*". The CFA results for testing the validity of this construct shows that model fit with RMSEA=.058, CFI= .969, and TLI= .955. Item 14 of moral self-regulation construct was dropped as it has negative coefficient and a not significant t-test results.

The school climate of Islamic boarding school

School climate served as Level 2 (school level) independent variable. The instrument used to measure the climate of Islamic boarding schools was adapted and modified from The Effective School Battery (ESB) (Gottfredson, 1999). As the school level predictor, the score for this variable was obtained by averaging students' responses to the school level. The instrument asked a set of statements pertaining to teacher attitudes, school safety, student involvement, and compleiance with school rules. The instrument consisted of favorable and unfavorable statements that range from 1 (strongly disagree for favorable item and strongly agree for the unfavorable item) to 4 (strongly agree for the favorable item and strongly disagree for the unfavorable item). Sample of item includes "*Para pengasuh pesantren memperlakukan santri dengan ramah/respect*." The confirmatory factor analysis results showed that the model is fit with RMSEA=.055, CFI= .962, and TLI= .952. All items were found to be valid as they have significant t-test results and positive coefficients.

Procedures

This study was done from February to July 2023 and consisted of three parts: preparation, implementation, and data processing. The preparation stage lasted for 2 months from February to March 2023. During the preparation phase, the authors collected literature related to the theory of aggressivity, self-regulation, and school climate, and their measurement instruments. Then, the authors adapted and modified the instruments to adjust them to the respondent targets who are high school adolescents living in Islamic boarding schools. Following this stage, the implementation stage was done from April to July 2023. In this stage, the authors printed the final instruments consisting of statements that measure aggressivity, self-regulation, and school climate, then attended the chosen Islamic boarding school to collect data. The third stage is data processing where the collected data was inputted into the computer, cleaned from missing data, and prepared for further analysis.

Analysis plan

Hierarchical data structure

The data follows a hierarchical structure, where students are grouped within schools. Analyzing such data requires acknowledging that each level of this hierarchy introduces distinct

variability. This means there is variability both among students and among schools. Failing to differentiate between these various sources of variability can lead to incorrect conclusions (Snijders & Bosker, 2012). Therefore, this study employed multilevel analysis to examine the data.

Conventional regression models are unsuitable for analyzing nested data because they don't consider the nested structure and its implications (Raudenbush & Bryk, 1986, 2022). In this study's dataset, the assumption of independent observations is violated. In other words, students within the same schools share experiences that can influence their responses (Raudenbush & Bryk, 2022; Sommet & Morselli, 2017). Moreover, standard regression models cannot estimate the variation between schools. In contrast, multilevel analysis accounts for the nesting of students within schools. This method allows for the inclusion of student and school variables at different levels and enables the calculation of between-school variance. Furthermore, multilevel analysis simultaneously estimates both student-level and school-level variance components related to the outcome variable of interest while appropriately handling the explanatory variables (Raudenbush & Bryk, 2022).

Data for this study were analyzed following a two-step process. The initial phase focused on accuracy and data quality of the data file. This involved examination of descriptive statistics and graphic representations of each variable. Phase 2 focused on missing data and outliers. There were missing values in some questions related to aggressivity, self-regulation, or school climate variable. Missing answer in any questions within those three variables results in removing respondent's data. The respondents' answers were then summed per variable and a check for outliers was done using the criteria of upper limit IQR+1.5*Q3 and lower limit IQR-1.5*Q3 for each variable. There were no outliers detected. Finally, after cleaning data, out of 551 respondents who filled the questionnaires, there are 428 respondents' data was used for further data analysis. In addition, the score of school climate was averaged for each school to obtain the school-level school climate scores.

Multilevel Analysis

In this analysis, a multilevel analysis or two-level hierarchical linear model (HLM) was employed to investigate both the variations between schools and the influence of individual student-level and school-level characteristics on aggressivity scores. At Level 1, the individual students were the focus, while at Level 2, the analysis centered on schools as the units of study. To enhance the interpretability of the estimates, a technique known as grand-mean centering was applied to all predictor variables. This involved subtracting each student's score from the overall mean of the respective predictor variable (Hox et al., 2010). The purpose of this procedure was to simplify the interpretation of the results (Sommet & Morselli, 2017).

As an initial step, a comparison between two intercept models was done to verify the need of multilevel analysis. The first model was the intercept-only linear regression model and the second model was the random intercept regression model. The second model separated the variance of the outcome variable into two distinct components: within-school and between-school variations, while the first model assumes that there is no between-school variation. Notably, both models did not incorporate any student or school-specific variables (Snijders & Bosker, 2012; Sommet & Morselli, 2017). The two models were then compared using the likelihood ratio test. If the likelihood ratio test result was significant then the multilevel analysis is needed, otherwise ordinary linear regression was enough to explain the data.

After assessing the extent to which aggressivity varied among different schools, the analysis proceeded in a hierarchical manner. At Level 1, student-level predictor was added to the initial model, which contained only intercepts. This step allowed for the estimation of the average relationship between student-level moral self-regulation and aggressivity. The purpose was to observe how the model changed as variable was included. The Level 1 model produced

a unique equation for each school, incorporating an estimated intercept, regression coefficients for each student-level predictor, and an error term.

Subsequently, at Level 2, school-level predictor namely school climate was introduced into the reduced Level 1 model. This step aimed to estimate the average relationships between both student-level and school-level predictors and their impact on aggressivity.

Model comparison

For every stage of the modeling, a likelihood ratio test was done to compare the additional variable with the previous model without additional variables to evaluate the need for the additional variable. Akaike's information criterion (AIC) is also used as the additional evaluation method for the models. This criterion serves as a general fit index used to gauge how well statistical models align with the data (Hox et al., 2010). All of the analysis in this study was done with the aid of the R software *lmerTest* package.

RESULTS AND DISCUSSION

Results

Descriptive Statistics

Table 1 presents the descriptive statistics of adolescent study subjects' characteristics and correlation analysis of predictor variables. The average aggressivity score was 49.63 (SD=6.64). Of the adolescent sample, 70% were female and 30% were male. The average age of study subjects was 15.45 years. The mean for the self-regulation and school climate scores was 50.10 (SD=4.39) and 50.26 (SD=7.86) respectively. Correlation analysis between the dependent variable and the predictors found that all predictors were significantly and negatively correlated with aggressivity. The degree of the correlation was medium level.

Table 1. Descriptive statistics of sociodemographic variables and intercorrelation of agressivity, self-regulation, and school climate.

Variables	Mean±SD or N(%)	Aggressivity	Self-regulation	School Climate
Gender				
Male	126(29.4)			
Female (reference)	302(70.5)			
Age	16.45±1.01			
Aggressivity (Dependent Variable)	49.63±6.64	1.000	- .486***	- .372***
Self-Regulation	50.10±4.39		1.000	.312***
School Climate	50.26±7.86			1.000

N= number of participants, SD=standard deviation, ***= correlation significant at 0.001 level

Intercept Models

Two intercept models (model 1 and model 2, See Table 2) were set up as the initial analysis. These are null models with no independent variables. Model 1 is the null model fixed intercept while model 2 is the null model with random intercept. Illustration related to the types of models with fixed and random effects is presented in Figure 1. The two intercept models were compared and tested using the Likelihood Ratio Test (LRT). The results of the likelihood ratio test when comparing Model 1 (intercept model) against Model 2 (random intercept model) was significant ($\chi_1^2 = 13.807,\ p < 0.001$) implying the existence of significant variation between-schools and the need for multilevel analysis. From the unconditional means model, the ICC was calculated with results of 0.98. This indicated that of the total variance in aggressivity, 9.8% is attributable to between-school variation. An ICC above 5% is recommended to use multilevel analysis (Kreft & de Leeuw, 1998; Meyers et al., 2016).

Multilevel Models

After testing the intercept models which conclude the need for multilevel analysis, we evaluate multiple models with various schemes of independent variables (fixed and random slope effects). Illustration related to the types of models with fixed and random effects is presented in Figure 1. In the model 3, a predictor of student-level (level 1) was added to the random intercept model, namely moral self-regulation. The coefficient of moral self-regulation predictor represents the change in the aggressivity associated with a one-unit change in the Level 1 predictor (moral self-regulation) while accounting for the variation in the aggressivity between schools. Since the coefficient value is - .725 with p-value < .000, this indicates that, on average, an increase in the adolescents' moral self-regulation is statistically significant associated with a decrease in the adolescents' aggressivity. Likelihood ratio test result between model 3 and model 2 was significant ($\chi_1^2 = 113.19, \mathrm{p} < 0.000$) indicating that moral self-regulation is an important predictor for decreasing aggressivity.

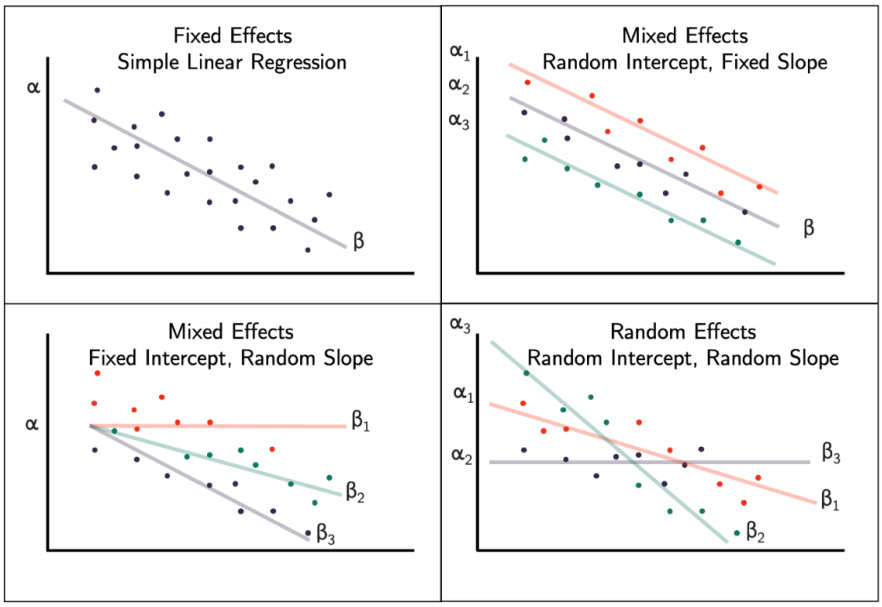

Figure 1. Illustration of Types of models with random effects
Source: (Midway, 2022)

The model 4 is the model 3 with additional Level 2 predictor namely school climate. After controlling random effects and individual moral self-regulation, the school climate was found to inversely associated with aggressiveness. The coefficient of the school climate represents the average change in the aggressivity at School-Level associated with a one-unit change in the school climate. The coefficient value is - .189 with p-value < .000, this indicates that, one-unit change in the school climate decrease aggressivity while controlling for the random intercept and moral self-regulation. After adding the school-level variable, the individual moral self-regulation remains significantly associated with decreased aggressivity ($\beta = -0.616, p < 0.000$). The llikelihood ratiotest result between model 4 and model 3 was significant ($\chi_1^2 = 24.272, p < 0.000$) indicating that school climate is a significant predictor for explaining adolescents' aggressivity.

Model 5 is Model 4 with random slopes, which is the model that allows the effect of moral self-regulation on aggressivity to vary between schools. The random slope provides insight into the extent to which moral self-regulation's effect differs across schools. However, the likelihood ratio test result between model 4 and model 5 was not significant ($\chi_1^2 = 3.533, p = 0.171$)

indicating that random slopes were not needed. Thus, Model 4 is used as the final model in this multilevel analysis as Model 4 shows the best fit with data.

Based on Model 4, the variance of the student-level residual errors, symbolized by σ_e^2, is estimated as 29.60. The variance of the school-level residuals errors, symbolized by σ_{u0}^2 , is estimated as 1.64. The regression coefficients for all two variables are significant. The regression coefficient for Moral Self-regulation is -0.62. This means that with each point higher on the moral self-regulation score measure, the aggressivity is expected to decrease by 0.62 scale points. The regression coefficient for school climate is -0.19, which means that for each point higher on the score of the school climate measure, the average aggressivity score goes down by 0.19 points.

Table 2. Multilevel Regression Coefficients

	Model 1: Intercept model	Model 2: Random intercept model	Model 3: Model 2 + fixed level 1 predictor	Model 4: Model 3 + fixed level-2 predictor	Model 5: Model 4 + Random Slopes
Fixed part	Coeff (S.E.)	Coeff (S.E.)	Coeff (S.E.)	Coeff (S.E.)	Coeff (S.E.)
Intercept	49.63 (0.32)*	50.12 (0.75)*	50.15 (0.61)*	50.16 (0.50)*	50.06 (0.50)*
Moral self-regulation			- 0.72 (0.06)*	- 0.62(0.07)*	- 0.65 (0.10)*
School-climate				- 0.19 (0.04)*	- 0.18 (0.04)*
Random part[a]					
σ_e^2		41.12 (6.41)	31.75 (5.63)	30.31 (5.51)	29.60 (5.44)
σ_{u0}^2		4.50 (2.12)	2.86 (1.69)	1.70 (1.30)	1.64 (1.28)
σ_{u1}^2					0.04 (0.20)
AIC	2838.5	2826.7	2715.5	2693.3	2693.7

*: significant with p-value < .05;

[a]: the values shown are variance and standard errors.

Discussion

While numerous research efforts have explored the association between self-regulation, school climate, and aggression, there is a scarcity of studies specifically conducted within the context of Islamic boarding schools. In this examination, our aim was to explore the connections between individual moral self-regulation, group school climate, and aggressiveness among Muslim youths in Islamic boarding schools. We took into account cluster-specific random effects in our analysis by employing multilevel regression analysis.

In multilevel analysis, tests for the significance of parameters can be done using the Likelihood Ratio Test (LRT). Using LRT, we can compare different models and obtain the best model fit with data to further evaluate model parameters' significance. The first model comparison was between two null models, Model 2 (null model with random intercept) and Model 1 (null model with fixed intercept). The LRT results showed that there is a significant difference between Model 2 and Model 1. This indicated that there is significant variation between schools, underscoring the necessity of employing a multilevel analysis to appropriately address and incorporate this observed variance.

The next model comparison was between Model 3 (a model with random intercept and a fixed effect of predictor level 1 added) and Model 2 (a null model with random intercept). The LRT results showed that the null hypothesis was rejected. The null hypothesis is “There is no significant improvement in model fit when adding the fixed effect of predictor level 1 to the model with only a random intercept”. This means that there is a significant difference in model fit between Model 3 and Model 2, indicating that adding fixed effects level 1 predictors improves the model’s ability to explain the data compared to the null model.

We further compare Model 4 (a model with random intercept, a fixed-predictor level 1, and a fixed-predictor level 2 added) and Model 3 (a model with random intercept and a fixed effect of predictor level 1 added). LRT results showed that there is a significant difference in model fit between Model 4 and Model 3. This implies that including the predictor level 2 in the model is better at explaining the data than the model with only one predictor.

The last comparison evaluated the need for random slopes by comparing Model 5 (a model with random intercept and random slopes of moral self-regulation predictors) with Model 4 (a model with random intercept, a fixed-predictor level 1, and a fixed-predictor level 2 added). LRT results demonstrated that there is no significant difference between Model 5 and Model 4. This indicates that adding random slopes does not improve the model fit significantly compared to a model with fixed effects of both predictors and a random intercept." Therefore, we conclude that Model 4 is the best fit with the data in this study.

Model 4 is the model with a random intercept and two fixed-effect predictors namely moral self-regulation and school climate, used for predicting the aggressivity as the dependent variable. Based on the results of this study, it is found that aggressivity is associated with individual and school-level variables. The individual independent variable is moral self-regulation while the school-level independent variable is school climate. Both independent variables are found to be statistically significant.

The results expressed that even after controlling for random intercept, individual moral self-regulation remains significantly associated with decreased aggressiveness. The random intercept means that there are differences between schools in terms of aggressivity. The existence of random intercept in the model also recognizes dependencies between students' aggressivity within the same school and thus provides a better model fit. The null hypothesis for the effect of moral self-regulation on the dependent variable, which read as "There is no significant effect of moral self-regulation on aggressivity", is rejected and the coefficient is in a negative direction. This implies that on average, we expect a decrease in aggressivity for every one-unit change in moral self-regulation. The finding of this study is in line with the study by DeWall et al. (2007). Research by DeWall et al. (2007) shows that a person's ability to restrain themselves internally can prevent aggressive behavior. DeWall (2017) found that individual differences in trait self-control moderated the effect of self-regulatory depletion on aggression. Likewise, our findings regarding moral self-regulation suggest that a person's general capacity for self-control, including in the moral domain, plays a role in their aggressive tendencies.

Bandura (1991) stated that the self-regulating system is involved in moral conduct. Adherence to moral self-sanctions allows people to deter transgressiveness (Bandura et al., 2001). In the context of Islamic boarding schools, the efforts to develop moral character can be made by implementing a typical Islamic boarding school-based moral development management (Sobry, 2022) and increasing the reading of the Qur'an (Apriyani et al., 2020).

The results revealed that even after controlling for random effects and having an individual-level variable (moral self-regulation), the negative association of aggressivity with school climate remains. The null hypothesis for the predictor level 2 read as "There is no significant effect of school climate on aggressivity". The results showed that the null hypothesis is rejected, and the coefficient is in a negative direction. This implies that there is an inverse association between school climate and aggressiveness. The negative sign of the coefficient indicates a decrease in aggressivity with an improvement in school climate. One-unit change in school climate will reduce aggressivity by 19% on average, with all other variables held constant. The findings of this study are in agreement with previous studies. A study by Wakhid et al. (2020) explained that aggressiveness is a common problem that happens during adolescence and is caused by personal conditions and the school environment. An Islamic boarding school, often referred to as *Pesantren*, is an educational institution in Indonesia designed to provide instruction on Islam with the aim of cultivating knowledgeable individuals

with strong moral values in the succeeding generation (Wakhid et al., 2020). Islamic boarding schools have the series of regulations or patterns that must be implemented and obeyed by the students. The strictness of the culture sometimes causing students become depressed and triggered them to do aggressive behavior (Wakhid et al., 2020). However, when teachers are supportive, school has safe learning environments, and there is positive peer interaction, then aggressive behavior can be reduced (Akman, 2021). While there have been limited studies considering school climate as a school construct, those that have explored this concept have similarly identified significant effects of school climate on outcomes related to violent behavior (Khoury-Kassabri et al., 2004).

Implications

This study highlights the importance of taking into account the school environment influence in addition to individual characteristic influence. Education is not only about curriculum and institutional policies (school climate) but also about nurturing individual traits and characteristics. Following the results of this study, the Islamic boarding school committee could consider conducting an assessment of student candidates regarding their moral self-regulation during admission selection. In this way, *pesantren* could identify the students' moral self-regulation baseline score at the beginning of their study period at *pesantren* which is useful for student selection criteria or for providing better assistance in students' moral self-regulation traits during study periods. The school committee should also continually evaluate and improve the school climate for better school ecology and thus reduce aggressive acts. This perspective promotes a more balanced educational experience. Furthermore, recognizing the simultaneous influence allows educators to tailor their guidance based on both the characteristics of the students and the overall atmosphere of the school. In addition, educators and administrators can implement preventive measures and interventions to address issues related to school climate and individual characteristics before they escalate, fostering a healthier and safer educational environment.

Limitations and Suggestions for Further Research

This study viewed school climate as a school-level predictor. For this aim, climate scores were evaluated as an overall measure derived from individual scores for each school, while individual differences among members were regarded as random errors. Past research has presented differing perspectives on whether school climate should be conceptualized as a property of the school or of individuals, and there is no clear statistical method for analyzing the correct conceptualization of school climate (Akman, 2021). It is recommended that future studies thoroughly investigate the rationale behind assessing school climate to accurately determine whether it should be conceptualized as an individual or school-level attribute. Secondly, the sample in this study came from 10 schools, while estimates produced from multilevel analysis are more reliable with the increasing number of groups. Thus, future studies are suggested to have a large number of groups for more promising results. In addition, the results of this study were generated from a sample of students who live in Islamic boarding schools in Java Island, Indonesia. Thus, the generalizability of findings may be constrained from the broader population of Islamic boarding schools. Moreover, the cross-sectional design of our analyses restricted our capacity to infer causality and necessitated awaiting longitudinal studies. However, we took into account some unobserved characteristics through multilevel modeling. Future studies are suggested to select samples from Islamic boarding schools with wider geographical areas and make comparisons between different educational settings besides Islamic boarding schools.

CONCLUSIONS

In conclusion, the aggressivity of adolescents in Islamic boarding schools is influenced not only by individual characteristics but also by community aspects at the school-level. At the individual-level, better moral self-regulations is significantly associated with a decrease in aggressive behavior. While at the community-level, positive school climate is inversely related with aggressivity. From a policy perspective, our findings suggest that tackling aggressivity in Muslim adolescents in Indonesia requires substantial effort in establishing supportive multilevel conditions. These include addressing both individual- and school-level factors that support good adolescents' behavior. Moral self-regulation and positive school climate matter.

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AUTHOR CONTRIBUTION STATEMENT

ZN leads the research from the initial to the final stage of research and is responsible for the religious content of the manuscript. WAS focuses on data management, data analysis, and overall manuscript writing. IH contribution is on data collection. MF focuses on writing the findings and final section of the manuscript.

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