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Self-Regulation in Adolescents: The Role of School-Based Support, Self-Efficacy, and Negative Peer Experiences

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Abstract

This quantitative study examined psychosocial predictors of adolescent self-regulation using data from the 2021/2022 Health Behaviour in School-Aged Children (HBSC) study in Poland (N = 5612). Data were collected using a standardized HBSC protocol, based on anonymous online questionnaires completed by students aged 11–17 in schools. Hierarchical regression showed that teacher and family support were positively associated with self-regulation, while self-efficacy, loneliness, and bullying victimization were negatively associated. Peer support was not a significant predictor. Contrary to some previous findings, girls reported lower self-regulation than boys. The results underscore the importance of strengthening adult support, enhancing self-efficacy, and addressing bullying victimization and loneliness to promote self-regulation development in adolescence.

Keywords: self-regulation, adolescence, social support, self-efficacy, bullying victimization, loneliness, predictors, regression.

Introduction

Self-regulation is a foundational skill that enables individuals to manage their emotions, behaviors, and cognitive processes, supporting their ability to achieve goals (Murray et al., 2019). Numerous studies have demonstrated its broad implications for life outcomes (Robson et al., 2020). Self-regulation in school-aged children is strongly tied to positive developmental outcomes, such as academic success and engagement (Duckworth et al., 2019), while reducing the likelihood of unhealthy or risky behaviors (Weidner et al., 2016). It is also closely connected to mental health and social functioning, i.e., associated with fewer internalizing problems (Klinge et al., 2023) and with greater competence in peer and romantic relationships during late adolescence (Moilanen & Manuel, 2017).

Because self-regulation is closely tied to adolescents' adjustment, it is important to understand how to support its development. Although it is often described as an individual capacity with a strong genetic component (Karlsson Linnér et al., 2021), it is also considered malleable and shaped by multiple environmental and contextual factors (Murray et al., 2019). For example, Murray and colleagues proposed the Applied Contextual Model for Promoting Self-Regulation, conceptualizing self-regulation as a developmental capacity shaped by interactions between individual predispositions and co-regulatory experiences in proximal environments, such as family and school.

In line with Murray et al.'s model, co-regulation refers to caregivers providing structure, emotional support, and guidance that temporarily scaffold children's and adolescents' self-regulation until it becomes more autonomous. According to Paley and Hajal (2022) co-regulation is created in ongoing patterns of emotional coordination, modeling, and mutual influence within the family system. In an analogous way, school-based frameworks (Pianta et al., 2012) emphasize teacher–student interactions as relational processes that support students' emotional and behavioral regulation as well as their cognitive engagement in the classroom.

Although research on the role of caregiver–child interactions in the development of self-regulation has focused primarily on early childhood,

longitudinal evidence indicates that parental support and autonomy granting continue to predict improvements in self-regulation in adolescence (Keskin & Branje, 2022; Wesarg-Menzel et al., 2023). In contrast, higher levels of parent–adolescent conflict are associated with poorer self-regulation, greater emotional and behavioral dysregulation, and increased adjustment difficulties (Ratliff et al., 2023). Beyond dyadic interactions, research further suggests that adolescents’ self-regulation is shaped by broader family dynamics, including interparental conflict (Wilson et al., 2024).

Extending contextual perspective to school settings, empirical findings show that schools likewise constitute an important context for self-regulation development across late childhood and adolescence (Li et al., 2021). Evidence from a systematic review (Cumming et al., 2020) and a meta-analysis (Vandenbroucke et al., 2018) indicates that teacher emotional support and classroom environments characterized by clear expectations, consistent routines, and proactive behavior management promote growth in executive functions and self-control, which are core components of self-regulation (Nigg, 2017). Conversely, teacher-student conflict and harsh school discipline may undermine self-regulation by creating stressful and inconsistent conditions that contribute to students’ behavioral and emotional dysregulation (Bailey et al., 2019).

At the peer level, social interactions can both support and undermine self-regulation. For example, adolescents show better self-regulation when they interact with highly self-regulated peers, but affiliation with peers who have poorer self-regulation can increase impulsivity and risk-taking (Busching, 2024). Also, negative peer experiences such as rejection or victimization can lead to long-term difficulties in self-regulation, including heightened emotional reactivity, reduced inhibitory control, and weaker planning capacity (Westermann et al., 2024). In other words, experiences of peer rejection during adolescence may diminish distress tolerance and heighten sensitivity to perceived loss of social connection or acceptance, which can impair self-regulation (King et al., 2018; Peng et al., 2023). Loneliness can further undermine self-regulation by increasing distress and reducing opportunities for co-regulation and social learning (Hawkey & Cacioppo, 2010).

Importantly, Murray et al. (2019) emphasize that self-regulation depends on individual resources that enable students to manage ongoing academic, social, and emotional demands. One such resource is self-efficacy beliefs, which influences how students approach challenges by shaping their motivation (Bandura, 1997; Maddux & Volkmann, 2010). Students who hold stronger beliefs in their own competence are more likely to set challenging goals and use a wider range of self-regulation strategies (Schunk & DiBenedetto, 2022). In contrast, low self-efficacy is associated with reduced persistence, which may potentially diminish participation in activities that build self-regulation skills in the long term (Honicke & Broadbent, 2016).

Taken together, these findings indicate that both individual factors as well as supportive and adverse social experiences are important for adolescents' self-regulation. Although numerous studies have examined individual or social predictors of self-regulation separately, fewer studies have investigated how individual resources and both positive and negative social experiences jointly contribute to adolescent self-regulation within a single analytic framework. This study addresses this gap by examining individual factors (self-efficacy) with both positive (family, teacher and peer support) and negative (bullying, loneliness) social experiences, aiming to provide a more nuanced picture of how these factors relate to adolescents' self-regulation. By identifying which factors show the strongest associations, the findings can provide guidance for educational practice and policy.

Aim of the study

To address the research gap, the study draws on Murray et al.'s (2019) *Applied Contextual Model for Promoting Self-Regulation Enactment Across Development* to examine how individual and environmental factors, such as self-efficacy, social support, loneliness, and bullying victimization, are associated with adolescent self-regulation. Using multiple regression analysis, the study seeks to identify key predictors and provide a more integrated perspective for the development of supportive strategies in educational settings.

Hypotheses

The hypotheses were formulated based on prior empirical findings and theoretical assumptions (Murray et al., 2019). Higher self-efficacy was expected to predict higher self-regulation (H2), given its role in sustaining goal-directed behavior. Supportive relationships with family, teachers, and peers were hypothesized to be positively associated with self-regulation (H3), whereas bullying victimization and loneliness were expected to be negatively associated with self-regulation (H4) due to their links with emotional distress and impaired regulation in previous studies.

Materials and methods

Study participants and design

The analyses used Polish data from the 2021/2022 Health Behaviour in School-Aged Children (HBSC) study, a large-scale WHO cross-sectional survey conducted every four years. Data are collected from nationally representative samples of 11-, 13-, and 15-year-olds, with 17-year-olds also included in the 2021/2022 Polish sample. The regression analyses were conducted using complete-case analysis (listwise deletion). After excluding cases with missing data and observations identified as outliers, the final analytic sample for regression analysis consisted of 5,612 adolescents aged 11–17 years ($M = 14.73$, $SD = 2.00$), including 3,182 girls (56.7%) and 2,430 boys (43.3%).

The study followed a standardized study protocol on sampling, measures, and data collection procedures. The study used a cluster probability sampling design with schools as the primary sampling unit. Detailed information on the methodology and protocol can be found elsewhere (Currie et al., 2014).

Instruments

Self-regulation

This study used the Polish short version of Self-Regulation Scale (SRS; Rodzeń & Gajda, 2024), consisting of 12 items across three subscales: emotional regulation (e.g., “I have difficulty controlling my temper”), cognitive regulation (e.g., “Once I have a goal, I make a plan how to reach it”), and behavioral regulation (e.g., “I get very fidgety after a few minutes if I am supposed to sit still”). Items are rated on a 4-point Likert scale from 1 (Never true) to 4 (Always true). Cronbach’s alpha was 0.74.

Self-efficacy

General self-efficacy was measured with a short 2-item version of Schwarzer and Jerusalem’s (1995) scale, validated for adolescents by Meilstrup et al. (2016). Items (“How often can you find a solution to problems if you try hard enough?”; “How often can you manage the things you set your mind to?”) are rated from 1 (Never) to 5 (Always). Scores (2–10) are summed and categorized as low (2–6), medium (7–8), or high (9–10).

Family and peer support

Family and peer support were measured with subscales from the Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988), validated in the HBSC network. Each consists of four items rated on a 7-point scale (1 = Very strongly disagree to 7 = Very strongly agree), with scores ranging from 4 to 28. In this study, McDonald’s ω was 0.93 for peer support and 0.94 for family support.

Teacher support

Teacher support was measured with a 3-item scale (e.g., “I feel that my teachers accept me as I am”) rated from 1 (Strongly agree) to 5 (Strongly disagree).

Developed by Torsheim et al. (2012) and validated within the HBSC network (García-Moya et al., 2023), the scale yields scores from 3 to 15. In this study, McDonald's ω was 0.84.

Loneliness

Loneliness was measured with a single item assessing perceived loneliness in adolescents (Vancampfort et al., 2019). Responses ranged from 1 (Never) to 5 (Always). Following established practice, options 1–3 (Never, Rarely, Sometimes) were coded as low loneliness (0) and 4–5 (Most of the time, Always) as high loneliness (1).

Bullying victimization

Bullying victimization was assessed with a scale adapted from the Olweus Bully/Victim Questionnaire (Solberg & Olweus, 2003) and validated in HBSC (Cosma et al., 2020). Responses ranged from “Not at all” to “Several times a week”. For analysis, the variable was dichotomized: 0 = not at all/once or twice, 1 = 2–3 times a month or more, distinguishing minimal or no bullying from frequent victimization.

Statistical methods

Before the main analyses, data were screened for distribution and test assumptions. All analyses were conducted in IBM SPSS Statistics 26 at a 95% confidence level. Pearson's r was used for continuous variables, and Spearman's rho for ordinal data. A hierarchical regression model estimated predictors of self-regulation.

The ICC for self-regulation in our sample was low (ICC = 0.03, <5%), indicating that only a small proportion of the variance was attributable to between-class differences. Although the large number of clusters (>650) does not eliminate within-cluster dependence, it reduces the risk of biased variance

estimation. Given the low ICC, clustering effects were considered minimal; therefore, single-level regression was used.

Results

Descriptive statistics and preliminary analyses

Descriptive statistics and the Kolmogorov-Smirnov normality test were conducted for each of the continuous variables (Table 1).

Table 1. Descriptive statistics for selected variables and the results of the Kolmogorov-Smirnov normality test

Variable	M	SD	Skew	Kurt	K-S
Self-regulation	32.78	4.73	-0.17	0.06	0.05 ***
Family support	5.03	1.74	-0.57	-0.77	0.13 ***
Teacher support	6.90	2.57	-0.04	-0.37	0.09 ***
Peer support	4.55	1.73	-0.29	-0.88	0.08 ***

Note. Skew = skewness; Kurt = kurtosis; K-S = Kolmogorov-Smirnov’s test.
Due to missing data, sample sizes varied across variables (maximum $N = 6,032$).
*** $p < 0.001$.
Source: Own elaboration.

The Kolmogorov–Smirnov test indicated that none of the variables followed a normal distribution ($p < 0.01$). However, skewness and kurtosis values between -1 and 1 (George & Mallery, 2010) suggested that deviations were not substantial. Given the large sample size, statistically significant Kolmogorov–Smirnov test results were expected even for minor deviations from normality. Therefore, skewness and kurtosis were considered more informative indicators of distribution shape, permitting analyses under the assumption of normality (Tabachnick & Fidell, 2019). Preliminary checks showed that only sex was significantly associated with self-regulation ($p < 0.05$), while family affluence and age were not, so only sex was included as a control variable. Outliers were assessed using Cook’s distance, Mahalanobis’ distance, and leverage indices, and 48 observations failing two or more criteria were excluded to prevent

distortion (Aguinis et al., 2013). Multicollinearity was not a concern, with VIF values between 1.01 and 1.20 and tolerance above 0.83 (Menard, 2002). Residual independence was confirmed with Durbin–Watson values between 1.5 and 2.5 (Maxwell & David, 1995), and homoscedasticity was verified by scatterplot.

Table 2. Correlation coefficients for selected psychosocial predictors of self-regulation

	Variable	1	2	3	4	5	6	7	8
Continuous variables	1. Self-regulation	–							
	2. Family support	0.35**	–						
	3. Teacher support	0.31**	0.31**	–					
	4. Peer support	0.17**	0.32**	0.20**	–				
Ordinal variables	5. Self-efficacy	0.37**	0.29**	0.20**	0.20**	–			
	6. Loneliness	-0.30**	-0.33**	-0.23**	-0.20**	-0.23**	–		
	7. Bullying victimization	-0.14**	-0.15**	-0.10**	-0.18**	-0.09**	0.08**	–	
Control variables	8. Sex	-0.20**	-0.10**	-0.12**	0.07**	-0.12**	0.17**	-0.10**	–

Note. Pearson's coefficient was used for continuous variables, and Spearman's coefficient was used for correlations involving ordinal variables. Sex was coded 1 for male and 2 for female.

Correlation analyses were conducted using pairwise deletion ($N = 6,032$).

** $p < 0.001$.

Source: Own elaboration.

As shown in Table 2, self-regulation was significantly and positively correlated with self-efficacy ($r = 0.37$), family support ($r = 0.35$), teacher support ($r = 0.31$), and peer support ($r = 0.17$; all $p < 0.001$). Negative correlations were found with loneliness ($r = -0.30$; $p < 0.001$) and bullying victimization ($r = -0.14$; $p < 0.001$). Also, sex was negatively correlated with self-regulation ($r = -0.20$; $p < 0.001$), indicating higher self-regulation among boys.

The main analyses

For testing psychosocial factors as predictors of self-regulation, hierarchical multiple regression was conducted, considering sex as a controlled variable (Table 3).

Table 3. Results of the hierarchical multiple regression for self-regulation as a dependent variable

Predictor	SE B	β	F	R ²	ΔR^2
Step 1					
Sex	0.12	-0.21 ***	270.38 ***	0.046	0.046
Step 2					
Sex	0.11	-0.18 ***	265.62 ***	0.285	0.240
Low self-efficacy	0.18	-0.34 ***			
Medium self-efficacy	0.16	-0.15 ***			
Family support	0.04	0.16 ***			
Teacher support	0.02	0.17 ***			
Peer support	0.03	0.01 ($p = 0.31$)			
Often lonely	0.13	0.13 ***			
Often bullied	0.20	-0.06 ***			

Note. The reference group for self-efficacy is "high", for loneliness is "not lonely", and for bullying victimization is "not often".

*** $p < 0.001$.

Source: Own elaboration.

In the first step of the hierarchical regression analysis, sex was defined as a predictor of self-regulation, $\beta = -0.21$, $p = 0.001$. This model was statistically significant, $F(1, 5648) = 270.38$, $p < 0.001$, and explained 5% of the variance ($R^2 = 0.046$). In the second step, self-efficacy, family support, teacher support, peer support, loneliness, and bullying victimization were added. The full model remained statistically significant, $F(8, 5641) = 265.62$, $p < 0.001$, and explained 29% of the variance in self-regulation ($R^2 = 0.285$), representing an increase in explained variance ($\Delta R^2 = 0.24$). Contrary to the initial assumptions, peer support was an insignificant predictor of self-regulation ($\beta = 0.01$; $p = 0.31$).

The strongest predictors were self-efficacy ($\beta = -0.34, p < 0.001$), sex ($\beta = -0.18, p < 0.001$), teacher support ($\beta = 0.17, p < 0.001$), and family support ($\beta = 0.16, p < 0.001$). Self-efficacy was entered as a categorical variable, with high self-efficacy as the reference group; thus, negative β coefficients for low and medium self-efficacy indicate reduced self-regulation compared to adolescents with high self-efficacy. Adding self-efficacy, social support, and negative social experiences substantially increased the explained variance ($\Delta R^2 = 0.24$), indicating that these factors contribute to self-regulation beyond sex.

Discussion

This study aimed to examine predictors of adolescents' self-regulation through the lens of Murray et al.'s (2019) applied contextual model for promoting self-regulation, focusing on individual resources (self-efficacy), caregiver support (teachers and parents), and positive and negative social experiences, including peer support, bullying victimization, and loneliness. The results indicate that, in line with the model, self-regulation is determined by various psychosocial factors.

Self-efficacy showed the strongest association with self-regulation among all predictors. This finding is consistent with theory linking low self-efficacy to reduced goal-directed efforts (Maddux & Volkmann, 2010), and suggests that adolescents with lower self-efficacy may lack the motivational resources needed to engage in self-regulation. Also, the findings are in line with longitudinal research showing that higher self-efficacy predicts better emotional regulation (Di Giunta et al., 2023) and greater use of cognitive regulation strategies in academic contexts (Trautner & Schwinger, 2020).

In addition to self-efficacy, parent support and teacher support emerged as important contextual correlates of adolescents' self-regulation. Consistent with Murray et al.'s (2019) model and previous empirical findings (Li et al., 2021), caregiver support may contribute to self-regulation through emotional attunement, structure, and scaffolding. Moreover, from a social cognitive perspective (Bandura, 1997), caregivers may also influence self-regulation indirectly by shaping children and adolescents' self-efficacy beliefs over time,

for example, by providing opportunities for mastery experiences and offering supportive feedback (Muenks et al., 2018; Wang et al., 2024).

By contrast, peer support did not significantly predict self-regulation, diverging from some prior research highlighting the role of peers in adolescents' functioning (Farley & Kim-Spoon, 2014). One explanation is that, while peers can provide a sense of belonging (Tomova et al., 2021), they are less likely to offer stable structure and regulatory guidance necessary for consistent co-regulation, as their own regulatory capacities are still developing (Murray et al., 2019). Notably, in our study, loneliness and bullying victimization were associated with poorer self-regulation, highlighting the potential relevance of adverse peer interactions for self-regulatory functioning. Together, these findings are consistent with Murray et al.'s (2019) model and suggest that, in adolescence, peer relationships may be linked to self-regulation primarily in the context of adverse experiences rather than through perceived peer support.

In addition, sex accounted for a small but significant portion of variance in self-regulation and remained significant after psychosocial factors were included. In the present study, girls reported lower self-regulation than boys, which contrasts with some previous findings suggesting higher self-regulation among female students (Chaplin & Aldao, 2013; Coyne et al., 2015). However, evidence on sex differences in self-regulation is often mixed, with associations varying by age and measurement tools (Tetering et al., 2020; Zondervan-Zwijnenburg et al., 2020). Such inconsistencies may also partly reflect contextual and cultural factors, including gendered socialization practices and expectations regarding emotional expression and behavioral control (Hosseini-Kamkar & Morton, 2014).

Conclusion

The findings highlight several key factors linked to adolescents' self-regulation. First, self-efficacy emerged as a strong predictor of self-regulatory capacity. Second, both parental and teacher support were significantly associated with higher self-regulation, emphasizing the role of caregivers in adolescent de-

velopment. Third, negative social experiences, such as loneliness and bullying victimization, were negatively linked to students' self-regulation, whereas peer support was an insignificant predictor. Taken together, these results suggest that adolescent self-regulation is shaped by the interplay of individual resources and social experiences. In line with Murray et al.'s model, the findings have important implications for efforts to support adolescent self-regulation, highlighting the combined relevance of individual skill development, supportive caregiver relationships, and school-level contexts. Accordingly, interventions aimed at promoting self-regulation in adolescence may benefit from strengthening adult–student relationships, fostering students' sense of competence and self-efficacy beliefs, and reducing exposure to bullying victimization and loneliness.

Educational relevance and implications

The present study highlights key factors linked to adolescents' self-regulation, offering practical directions for schools. Strengthening students' regulatory skills requires attention to both individual and contextual supports. Teachers can:

1. Create a supportive classroom climate – use clear expectations, positive discipline, and respectful interactions to build trust and motivation (Piccolo et al., 2019; Li et al., 2021).
2. Build students' self-efficacy – give them chances to succeed, provide constructive feedback, and encourage effort. This also includes promoting a growth mindset so students see challenges as opportunities (Yeager & Dweck, 2012).
3. Support emotional and physiological regulation – integrate movement breaks, relaxation strategies, and predictable routines to help students manage stress (Maich et al., 2019; Toussaint et al., 2021).
4. Address loneliness – poor relationships with teachers contribute to student loneliness, and loneliness in turn may further strain those relationships, creating a self-reinforcing cycle (Zheng et al., 2024). This underscores the important role teachers play in addressing

student loneliness, as they can help mitigate students' feelings of loneliness. Interventions may therefore benefit from increasing teacher awareness of loneliness and prioritizing supportive teacher–student relationships as a foundation. More broadly, schools can foster a sense of belonging through inclusive practices, collaborative group work, and structured opportunities for positive peer interactions (Van Ryzin & Roeth, 2018; Eres et al., 2021).

5. Prevent bullying – implement whole-school programs with clear policies, teacher training, and peer mentoring. Since low self-regulation increases the risk of both victimization and aggression, teaching regulatory skills should be part of anti-bullying efforts (Ttofi & Farrington, 2011; Williams et al., 2024).

Limitations

This study has several limitations. First, its cross-sectional design prevents causal inference; the direction of associations between self-regulation and psychosocial factors remains uncertain, and longitudinal studies are needed to test bidirectional effects. Second, the analyses did not adjust for the clustered sampling design (students nested within classes), which may have led to underestimated standard errors. However, the large sample size and low ICC (0.03) increase confidence in the robustness of the observed associations. Third, while we focused on psychosocial predictors, self-regulation is also strongly shaped by genetics, with heritability estimates of about 60% (Willemse et al., 2019). Future research should use genetically informed designs to disentangle biological and environmental influences.

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