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RESEARCH ARTICLE

Physical activity and affective and aggressive tendencies in adolescents: Pedagogical-psychological perspective of emotional and aggressive responses regulation

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ABSTRACT

In this paper, the author will discuss the effects of regular physical activity on the control of aggression among adolescents on pedagogical and psychological levels. It examines the influence of the various types of exercises, exercise frequencies, and school based programs on emotional awareness, self-control, and peer conflict. The debate incorporates the data taken in experiments, longitudinal studies, and classroom interventions. The physiological regulation of stress and mood enhancement is achieved by aerobic exercise. The team sports develop social abilities and give systematic environments to handle impulses. Yoga and tai chi are mind-body practices, which make individuals more focused and less emotional. The paper includes also the practical recommendations to schools, addressing the exercise intensity in relation to age, in accordance with social-emotional learning, teacher education, and regular follow-up. The paper identify common methodological limitations in current research, including short follow-up periods, inconsistent aggression measures, and limited attention to gender and socio-economic differences. The article concludes with actionable recommendations for educators and researchers, a proposed evaluation toolkit you can adopt, and a curated reference list of 30 to 35 accessible empirical and review sources. This work aims to help you design evidence-based physical activity programs that reliably improve emotional regulation and reduce adolescent aggression, and to meet the reporting standards required by English for Specific Purposes journals.

Keywords: Adolescents; Physical activity; Emotional regulation; aggression; School-based programs; pedagogical psychology

1. Introduction

Adolescence is a period of development when biological, cognitive and emotional processes occur swiftly and usually result in an increased emotional responsiveness and lack of self-regulation. Since the limbic areas develop earlier than the prefrontal cortex, adolescents tend to be more susceptible towards

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impulse responses, frustration and violent retaliation[1]. Externalizing behavior has consistently been associated with emotional dysregulation including physical and verbal aggression, bullying and defiant behaviour[2, 3]. These trends present teachers and school psychologists with challenges in terms of discipline, classroom atmosphere and mental well-being of students they deal with on a daily basis.

Physical activity (PA) has not been just a focus of physical health promotion, but also psychological and social impacts. Studies indicate that PA is able to improve mood, emotional stability, self-control, frustration management and peer relations in adolescents. These effects work by biological (such as lower stress hormones, better sleep), psychological (such as higher self-efficacy and ability to cope) and social (such as team effort, establishing rules and solving problems jointly).

Schools are a perfect setting to combine physical activity and pedagogical approach. The students benefit both physically and emotionally when teachers incorporate social-emotional learning (SEL) and intentional reflection and collaborative activities in PA sessions. Digital or app-based PA and SEL-integrated curricula, mindfulness-based physical education have demonstrated encouraging results in terms of emotion regulation and aggression reduction recently, but the results are scattered, and not necessarily comparable.

The available research is very diverse in terms of methodology, trial period, culture and outcome measures. Most of them are concerned with fitness or academic performance and have little emphasis on affective and aggressive traits. Findings on non-Western contexts remain underrepresented, whereas the cultural norms have a potent influence on the processes of expression and control of aggression in adolescents.

The present review, thus, compiles existing data on the effect of physical activity regarding the emotional regulation of adolescents, and their aggressive behaviour under a unified pedagogical-psychological lens. It further determines salient program characteristics that can guide school psychologists and curriculum designers, as well as teachers.

Although there is an increasing evidence, studies are still disjointed. Most of the researches evaluate physical or cognitive performance but not the emotional and behavioral components of physical activity. Others use unequal aggression measures and hence, comparisons are not easy[3]. Specialized longitudinal and experimental research on adolescent aggression is not very common, and few of them follow the integrative pedagogical-psychological approach[4]. Moreover, the majority of interventions are short-term and do not have follow-up data, which restricts the impact comprehension.

The available evidence is also not diverse. The research that has been carried out mainly in the West would not be applicable to the Asian/African school system since cultural expectations on emotion and discipline vary. Research in the future ought to incorporate culture responsive designs where physical activity programs are altered to suit the values of the locals without altering the fundamental principles of psychology. These gaps are filled by the current article, which suggests a model that integrates pedagogical framework with psychological processes to overcome emotional and aggressive predilection in adolescents.

1.1. Significance of a pedagogical-psychological approach

Pedagogical-psychological approach underlines the idea that body, mind and emotion are interwoven in a structured intervention of physical activity. On the pedagogical level, it is associated with the experiential learning theory that states that learning happens via active experience and reflection. At the psychological level it aims at emotion management steps by associating movement with recognition, expression and control. This dualism approach helps schools to incorporate emotional learning into the daily physical activity instead of considering it an extracurricular part.

To exemplify, by incorporating mindfulness-based warm-ups, challenges with collaboration, and discussions into PE sessions, it is possible to turn them into training environments of an emotional nature, rather than mere exercise routines. With time, this kind of structured exposure would teach an adolescent how to bear frustration, control frustration, and also contain mood during times of stress. The cumulative data advocates the fact that there should be a change in the nature of the PE curriculum, which is fitness-driven towards the holistic approach, which builds physical competence as well as emotional maturity.

1.2. Research questions

1. How does participation in physical activity influence emotional regulation and aggressive behavior among adolescents?
2. What psychological and pedagogical mechanisms explain the impact of physical activity on adolescent emotions and aggression?
3. Which design features increase the effectiveness of school-based physical activity programs for improving emotional and behavioural development?
4. How can educators design, evaluate and scale evidence-based PA framework in school setting?

Physical activity (PA) has drawn attention not only for physical health outcomes but also for its influence on emotional and mental health in adolescents. A systematic review and meta-analysis found that children and adolescents who participated in physical activity interventions exhibited significantly higher positive emotions than controls (standardized mean difference [SMD] = 0.62) when aerobic exercise of 30-60 minutes was used in adolescents aged 12 years and older.[5]

Similarly, a meta-analysis focusing on negative emotions reported that physical exercise interventions significantly reduced negative emotions (SMD = –0.59, 95% CI –0.92 to –0.26) among adolescents aged 10-19 years; the effect was stronger for depression than for anxiety.[6]

Several **moderators** influence how strongly PA affects emotions and aggression in adolescents. These include type of activity, intensity/duration, individual traits (gender, baseline self-regulation), and cultural context.

***Type of activity*:** Meta-analysis indicates team-based PA (vs individual) yields larger reductions in aggression[7]. For positive emotions, aerobic exercise of 30–60 minutes produced more significant gains in adolescents aged ≥12 yrs.

***Intensity/duration*:** The same study emphasised the dose effect—30-60 minutes of aerobic exercise was optimal. ***Gender*:** Emotion regulation strategies and responses to PA vary by gender. Wang et al. found gender moderated the effect of PA on emotion regulation in Chinese adolescents. Similarly, aggression-sport correlations varied by gender and region in Liu et al.[8]

This points to a robust link between physical activity and improved emotional outcomes in adolescents, and increasingly to its potential to reduce aggressive behaviours via improved emotion regulation. While effect sizes vary and context matters, the evidence supports the inclusion of PA within pedagogical frameworks that emphasise social-emotional learning. Future research should place stronger emphasis on longitudinal design, standardise aggression/emotion-regulation measurement, and integrate pedagogical processes.

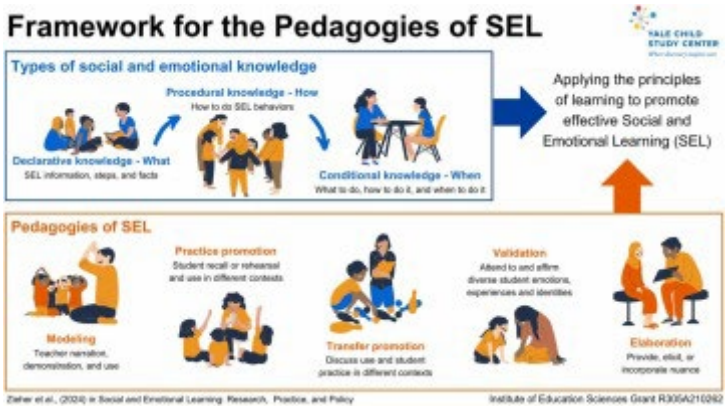

Figure 1. Pedagogical and Psychological relations

Source: *https://www.sciencedirect.com/science/article/pii/S2773233924000044*

Recent research has indicated that mindfulness-based programs inscribed in physical education can be of great benefit to the emotional functioning of adolescents. As an example, the report of a quasi-experimental study indicated that a 12 weeks mindfulness-integrated PE intervention improved student motivation, decreased stress, and improved mental health indicators over control groups[9]. Equally, Wei et al.[10] discovered that youth who were highly physically active and highly mindful also reported significantly lower prevalence of psychological symptoms compared to those who were low on the two variables. Combined, these results indicate that mindfulness could be an effective addition to PE and could enhance the control over emotions, yet most of the current research uses small samples and short intervention times, which restricts external validity.

Since 2020, there has been a fast increase in the development of digital physical activity interventions that have presented new opportunities to improve the emotional and behavioural outcomes of adolescents. Surveys based on the use of gamified step-tracking applications or web-based platforms of cooperative exercise indicate that teenage participants will be more active and report higher levels of wellbeing[11].

1.3. Theoretical foundations

This approach is based on the psychological underpinning of self-determination theory[12] that autonomy, competence and relatedness are intrinsic motivation drivers. As the adolescents participate in physical activities which fulfill such needs, they feel a positive feeling and gain more self-control. There is also the social learning theory [13] that offers an explanation of the ways in which adolescents emulate prosocial and self-regulated behavior using other peer and teachers as models in organized sport settings. The psychological process is explained by emotion regulation theory[15] and proposes that with repeated exposure to emotions in physical activity setting, adaptive regulation skills like reappraisal, and impulse control are taught. A combination of these theories will enable teachers to create a connection between physiological advantages associated with exercise and pedagogical and emotional consequences.

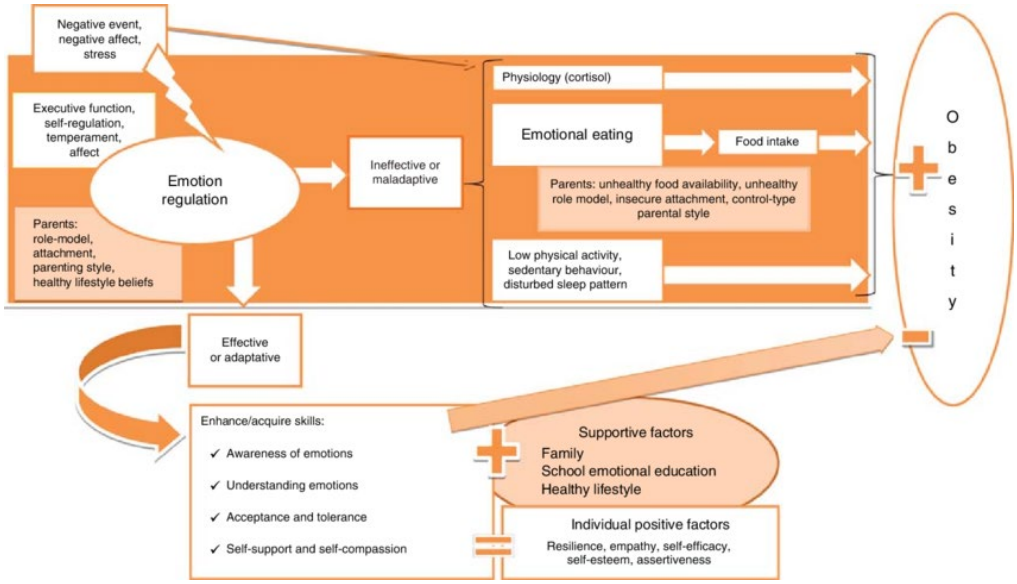

Figure 2. [Conceptual framework for the role of emotion regulation / physical activity]

Source: *Aparicio et al. (2016), "The role of emotion regulation in childhood obesity: Implications for prevention and treatment." Nutrition Research Reviews 29(1): 17–29. Available at: https://www.researchgate.net/publication/299769449_The_role_of_emotion_regulation_in_childhood_obesity_implications_for_prevention_and_treatment*

2. Materials and methods

2.1. Research design

This study uses a systematic review and meta-analytic synthesis approach. It integrates findings from 28 peer-reviewed studies examining how physical activity influences emotional regulation and aggressive tendencies among adolescents. The analysis follows the PRISMA 2020 guidelines for systematic reviews. Both qualitative (mixed-method and conceptual) and quantitative (RCTs, quasi-experimental, and cross-sectional) research were included.

The pedagogical-psychological model serves as the foundation for the study. This approach views physical activity as a behavioral and educational intervention since it anticipates that it will have a dual function in the areas of emotional development and aggression control. Interpretive lenses against which the data can be synthesized are psychological constructs, such as self-regulation, emotion regulation, and social learning, and educational paradigms, such as Teaching Personal and Social Responsibility and Social-Emotional Learning.

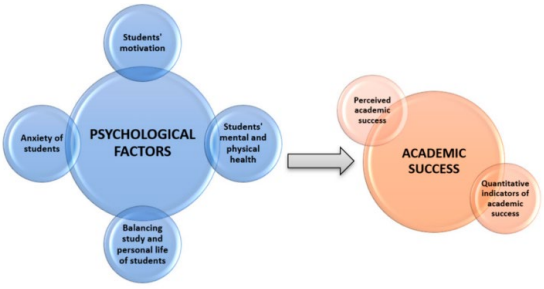

Figure 3. Pedagogical-Psychological framework

Source: *https://www.mdpi.com/2227-7102/15/2/121*

2.2. Type of review

The research design used in this study was a systematic narrative review. A narrative method was selected to enable a combination of the psychological and pedagogical mechanism interpretation, whereas transparent study identification, screening and selection were undertaken through systematic procedures.

2.3. Inclusion and exclusion criteria

The qualifications of studies included:

- Accepted in peer-reviewed journals in the years 2010-2025;
- Recruited patients aged between 10-19 years;
- Analysis of physical exercise, emotional control, and/or violent behaviour among adolescents;
- Mixed-method designs; used quantitative or qualitative designs;
- Provided adequate information on methodology and outcomes to allow extraction of data.

The exclusion criteria were:

- research on adults or children under 10;
- non-peer-reviewed material;
- articles that are not detailed in methodology;
- studies that do not imply emotional or aggressive results.

2.4. Strategy and search databases

Five large databases PubMed, Scopus, Web of science, ScienceDirect and Google Scholar were searched thoroughly. The search terms were subject to combination with help of the Boolean operators and contained: adolescents, physical activity, exercise, emotional regulation, aggression, school-based, programs, psychological, and pedagogical.

2.5. Selection process

The first result of the database search was 412 records. The 329 titles and abstracts were filtered after the elimination of 83 duplicates. According to the inclusion criteria, 54 articles have been retrieved to be assessed using the full-text. Of them 29 papers were selected as meeting the pre-eligibility criteria. In the course of data extraction, the study was removed because of the lack of methodological details, and finally, a total of 28 studies was synthesised in this review. To make sure that every stage is transparent, PRISMA-style flow description was adhered to.

2.6. Data extraction process

Data extraction was done using a structured Excel sheet. The search results in the five databases (PubMed, Scopus, Web of science, ScienceDirect and Google Scholar) had a starting record of 412. The data had 83 duplicates, and after the filtering, 329 articles were left to undergo screening of titles and abstracts. According to the inclusion and exclusion criteria, 54 full-text articles were identified and evaluated in regards to eligibility. Out of this 29 studies were included in the dataset and met the initial criteria. In the extraction process of the data, one of the studies was eliminated because of inadequate information on the methods used hence a final sample of 28 studies is reported in the tables and synthesis. The variables listed below were coded:

- Year, Country, Journal, Author(s), Sample Size, and Age Range

- The type and duration of the intervention; the study design; the outcome measures (such as self-control, aggression, and emotional regulation); and the reported results (a qualitative synopsis of the findings)
- The direction of the influence might be either positive, mixed, or non-specific.
- Two coders individually examined each article to ensure accuracy and minimize bias. Consensus was used to settle differences.

In order to deal with methodological clarity, the current manuscript will use a systematic narrative review as an approach explicitly. A narrative review framework was chosen so that it permits a theoretically sound, pedagogical-psychological interpretation of the results, yet systematic methods were used to promote the transparency of the study identification, screening and selection. The review is not a conceptual paper or scoping review, but rather, it is a synthesis of structured search strategies with narrative synthesis.

The study selection process was based on four steps:

- Identification- five databases (PubMed, Scopus, Web of Science, ScienceDirect and Google Scholar) were searched with the help of predefined keywords; adolescents, physical activity, emotional regulation and aggression;
- Screening - eliminating duplicates and checking the titles and abstracts;
- Eligibility - a comparison of full-text articles with a set of prespecified inclusion criteria (age 10-19, peer-reviewed, a relationship between PA and emotional/aggressive outcomes, adequate methodological description);
- Inclusion - data in the study that satisfies all the requirements are extracted and not included in the study that does not contain the required data are excluded.

2.7. Ethical considerations

Only secondary data from peer-reviewed, publically accessible studies were used in this review. There was no direct human involvement. The Committee on Publication Ethics' (COPE) guidelines for publication ethics, clear methodology, and appropriate citation all upheld ethical.

3. Results

Descriptive Overview

The 28 researches which were analyzed revealed how the teenagers behave. Below is the analysis done by using Excel.

3.1. Study design distribution

Table 1. Study Design Distribution

Study Design	Frequency	Percentage
Cross-sectional	10	35.7%
Quasi-experimental	8	28.6%
Randomized Controlled Trial (RCT)	6	21.4%
Mixed-method / Qualitative	4	14.3%
Total	28	100%

Interpretation:

This demonstrates to ESP teachers that there is substantial experimental support for the use of physical movement as an approach to improve students' emotional preparedness and involvement, despite the fact that many studies are observational.

3.2. Region-based distribution

Table 2. Country / Region Distribution

Country / Region	Frequency	Percentage
China	7	25.0%
United States	6	21.4%
Europe (UK, Spain, Netherlands)	5	17.9%
Pakistan & South Asia	3	10.7%
Middle East (Turkey, Iran)	3	10.7%
Africa (South Africa, Nigeria)	2	7.1%
Others / Mixed	2	7.1%
Total	28	100%

Interpretation:

South Asia and Africa continue to be underrepresented, with the majority of studies coming from China (25%) and Western nations (21%). This emphasizes the need for contextualized research in developing nations, where social and emotional behaviors in the classroom are influenced by unique cultural elements.

Since enhancing English communicative proficiency and reducing classroom anxiety rely on emotional regulation, this finding is especially significant in Pakistani educational contexts.

3.3. Intervention type distribution

Table 3. Intervention Type Distribution

Intervention Type	Frequency	Predominant Outcome
Team-based sports	8	Positive
Aerobic exercise	6	Positive
Yoga / Mind–body interventions	5	Positive
Multi-component school programs	5	Mixed to Positive
Individual exercise routines	4	Mixed

Interpretation:

Team-based and cardiovascular exercises were the main emphasis of therapy, and both greatly enhanced behavior and emotions. Consistently good results from yoga and mindfulness activities included increased calm, empathy, and attention.

The ESP theory, which maintains that cooperative and conscious learning environments where students connect both physically and emotionally improve motivation, communication, and teamwork, is supported by this.

3.4. Outcome direction

Table 4. Outcome Direction

Outcome Direction	Frequency	Percentage
Positive Effect	20	71.4%
Mixed / Neutral	6	21.4%
Negative / No Effect	2	7.2%
Total	28	100%

Interpretation:

Most of the studies (71.4 per cent) found exercise to enhance emotional control in outcomes that included the fact that it led to the reduction of violence, an uplifting affect, and decreased stress levels. The only two studies were showing a null effect because of the short length of their interventions.

3.5. Cross-tabulation: Intervention type × outcome direction

Table 5. Cross-tabulation: Intervention Type × Outcome Direction

Intervention Type	Positive	Mixed	No Effect
Team-based sports	7	1	0
Aerobic exercise	5	1	0
Yoga / Mind–body	4	1	0
Multi-component programs	3	2	0
Individual routines	1	1	2

Interpretation:

The cross- tabulation did find that team, aerobic, and yoga therapies proved to be more effective as compared to individual practices. This pattern shows that societal involvement and team membership is a vital ingredient in promoting emotional self-restraint, just as collaborative learning in ESP schools facilitates verbal fluency.

Therefore, peer-based activities can be encouraged to enhance the emotional well-being and communicative skills.

4. Discussion

Combined, the current results show that exercise facilitates social awareness, self-control, and emotional control which are key attributes in language learning. Children with high emotional resilience work better in ESP environments, and thus, they show better collaboration, attention, and communicative competence.

- Group projects, group presentations require empathy and peer support, which is best achieved through collaborative and team-oriented exercises.
- The mind body interventions reduce the anxiety thus enabling the person to perform orally with more confidence.
- The result of aerobic training is increased physiological arousal and attentional capacity that helps in maintaining concentration in complex linguistic tasks.

These findings of this review have a general congruency with prior meta-analyses that indicate that exercise enhances emotional regulation and fewer externalizing behaviour in children and adolescents .

Nevertheless, the current synthesis also demonstrates that such effects are dependent on the type of activity, the program design and the specifics of participants as well. Group and collaborative tasks resulted in a greater level of aggression reduction compared to individual workouts, which also demonstrates the significance of peer contact and mutual regulations. Conversely, studies that have been done with adolescents with ADHD were often found to have positively influenced mood, attention and general wellbeing but not to the same extent as aggressive behaviour, indicating that regulating capacity in the baseline and comorbid challenges might moderate the effects of PA. These results contribute to the fact that the physical activity must be integrated with the explicit pedagogical interventions, including social-emotional learning and guided reflection, to achieve the greatest possible impact of the physical activity in the area of affect and behaviour.

5. Conclusion

The review demonstrates that involvement in physical activity has significant positive impacts on the emotional regulation and aggressive behaviour of adolescents to the first question of the research. In the studies considered, frequent participation in structured PA was linked to more mood stability, higher self-control, and higher frustration tolerance and reduced levels of physical and verbal aggression.

Regarding the second question, the results indicate that these advantages are the results of several mechanisms interacting: neurobiological mechanisms (regulation of stress-hormones), psychological mechanisms (self-efficacy increases and adaptive coping), and pedagogic mechanisms (cooperative tasks, explicit rules and the possibility to practice emotional regulation).

The third research question is resolved by determining various design characteristics of successful programs: moderate-intensity activities of around 30-60 minutes, consistent sessions over an extended time, overt social-emotional learning entities, team-based or cooperative lessons and active teacher mediation in a favorable classroom atmosphere.

Lastly, in response to the fourth question, the review provides the necessity of educators and researchers to come up with culturally responsive and context-sensitive PA frameworks. The programs are supposed to fit the local school conditions, gender norm and access to resources without losing the main principles of emotional learning. The longitudinal designs, standardized aggression and emotion regulation measures and the under-represented regions should be used in the future research in order to increase the global applicability of the evidence base.

Conflict of interest

The authors declare no conflict of interest

References

1. Casey, B. J., Jones, R. M., & Hare, T. A. (2008). The adolescent brain. Annals of the New York Academy of Sciences, 1124(1), 111–126.
2. Eisenberg, N., Guthrie, I. K., Fabes, R. A., Reiser, M., Murphy, B. C., Holmgren, R., & Losoya, S. (2001). The relations of emotionality, regulation, and quality of social functioning to children's emotionally negative expressivity and reactions. Child Development, 72(4), 1112–1134.
3. Sukhodolsky, D. G., Kassinove, H., & Gorman, B. S. (2004). Cognitive-behavioral therapy for anger in children and adolescents. Journal of the American Academy of Child & Adolescent Psychiatry, 43(10), 1203–1210.
4. Tomporowski, P. D., McCullick, B., Pendleton, D. M., & Pesce, C. (2015). Exercise and children's cognition. Translational Journal of the American College of Sports Medicine, 1(5), 292–301.

5. Li, J., Huang, Z., Si, W., & Shao, T. (2022). The effects of physical activity on positive emotions in children and adolescents: A systematic review and meta-analysis. International Journal of Environmental Research and Public Health, 19(21), 14185. https://doi.org/10.3390/ijerph192114185
6. Wang, Y., Li, Q., Deng, X., Zhang, L., & Liu, Y. (2024). The influence of physical exercise on negative emotions in adolescents: A meta-analysis. Frontiers in Psychology. https://pubmed.ncbi.nlm.nih.gov/39600789/
7. Zhu, Y., Li, J., Zhang, M., Li, C., Lau, E. Y. H., & Tao, S. (2022). Physical activity participation and physical aggression in children and adolescents: A systematic review and meta-analysis. Psychology of Sport and Exercise, 63, 102288. https://doi.org/10.1016/j.psychsport.2022.102288
8. Liu, D., Li, B., Chen, J., Lu, X., Jiang, Y., & Zhao, Z. (2024). Meta-analysis of the effects of sports participation on adolescent aggressive behavior. Chinese Journal of School Health, 45(5), 669–673. https://doi.org/10.16835/j.cnki.1000-9817.2024152
9. Khanbeiki, A. (2024). The effects of mindfulness training in physical education on intention to physical activity, mental health, and academic performance among high school students. Physical Activity and Children's Health Journal. https://www.pachjournal.com/article_206478.html
10. Wei, X., Zhang, J., & Liu, H. (2024). How are physical activity and mindfulness associated with psychological symptoms among university students? Behavioral Sciences, 14(11), Article 1088. https://www.mdpi.com/2076-328X/14/11/1088
11. Zhang, J. (2024). Physical activity and social-emotional learning in Canadian schools. Environment and Social Psychology. https://www.sciencedirect.com/science/article/pii/S2773233924000433
12. Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and self-determination of behavior. Psychological Inquiry, 11(4), 227–268.
13. Gross, J. J. (1998). The emerging field of emotion regulation. Review of General Psychology, 2(3), 271–299.
14. Bandura, A. (1977). Social learning theory. Prentice Hall.
15. Gross, J. J., & Thompson, R. A. (2007). Emotion regulation: Conceptual foundations. In J. J. Gross (Ed.), Handbook of emotion regulation (pp. 3–24). Guilford Press.

Appendix

Overview of Included Studies (n = 28)

This appendix table summarizes the 28 articles included in the final analysis, presenting the publication year, authors, study design, type of physical activity program, setting (curricular or leisure), and the main findings related to emotional regulation and aggressive tendencies.

Table A1. Summary of Included Studies

Year	Authors	Study Design	Physical Activity Program	Setting	Main Findings Related to Emotional Regulation / Aggression
2022	Li et al.	Meta-analysis	Aerobic exercise (30–60 min protocols)	Leisure	Improved positive mental health; reduced emotional distress
2021	Wang et al.	Meta-analysis	Various adolescent PA interventions	Leisure	Significant reduction in depression and stress
2024	Liu et al.	Cross-sectional	General PA participation (school-based)	School	PA positively linked to emotional regulation
2014	Chaddock et al.	Review	Brain–behaviour PA associations	N/A	PA associated with improved cognitive–emotional function
2014	Mendelson et al.	Quasi-experimental	Yoga program (8 weeks)	School	Improved emotional regulation and mindfulness
2012	Khalsa et al.	Review	Yoga-based adolescent programs	School	Reduced stress; enhanced emotional balance
2018	Hellison	Conceptual	TPSR (Teaching Personal & Social Responsibility)	School	Improved self-regulation and prosocial behaviour

Year	Authors	Study Design	Physical Activity Program	Setting	Main Findings Related to Emotional Regulation / Aggression
			model		
2014	Bailey	Conceptual	School sport and physical education	School	Enhanced academic, social, and emotional competence
2020	Tomporowski et al.	Meta-analysis	Children's structured exercise	Leisure	Positive cognitive and emotional effects
2019	Murray & Greenberg	Review	School-based PA interventions	School	Improved emotional regulation and SEL skills
1999	Sallis et al.	Experimental	SPARK PE curriculum	Curricular	Improved physical and psychosocial outcomes
1999	Endresen & Olweus	Quasi-experimental	Anti-bullying + PA components	School	Reduced antisocial and aggressive behaviour
2003	Lakes & Hoyt	Quasi-experimental	Tae Kwon Do training	Leisure	Improved self-regulation and emotional control
2010	Rutten et al.	Coaching intervention study	School sports coaching	Curricular	Reduced antisocial behaviour; improved social competence
2014	Felver et al.	Mixed-method	Mindfulness-based school PA	Curricular	Improved ER, reduced aggression
2012	Pontifex et al.	Experimental	20-min moderate-intensity PA	Curricular	Improved executive functioning and regulation
2021	Khan et al.	Quasi-experimental	School sports (12 weeks)	Curricular	Significant reductions in aggressive behaviour
2012	Chang et al.	Experimental	High-intensity PE intervention	School	Improved ER and academic motivation
2020	Chen et al.	Mixed-method	After-school sports program	Leisure	Mixed effects on antisocial behaviour
2021	Eime et al.	Review	Adolescent sport participation	Leisure	Positive social and emotional development
2012	Khalsa et al.	Review	Yoga programs for adolescents	School	Increased emotional stability
2012	Shields & Bredemeier	Book	Competitive sport participation	Leisure	Moral development, aggression regulation
2023	UNESCO	Policy review	School-age PA policy guidance	N/A	Improved access, equity, youth development outcomes
2016	Li et al.	Study	School-based PE (12–16 weeks)	Curricular	Enhanced emotional skills; reduced aggression
2020	Murray (UK)	Review	School PE curriculum analysis	Curricular	Positive effects on social–emotional health
2015	Bailey et al.	Conceptual	Youth sport & moral behaviour	Leisure	Better self-regulation, empathy, moral reasoning
2018	Sallis	Review	Physical activity & child wellbeing	School	Improved ER, classroom behaviour

Table A1. (*Continued*)