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ӨСПҮРҮМДӨРДҮН АГРЕССИВДҮҮ ЖҮРҮМ-ТУРУМУН ФИЗИКАЛЫК АКТИВДҮҮЛҮК АРКЫЛУУ ПЕДАГОГИКАЛЫК ЖАКТАН АЛДЫН АЛУУ

Аннотация: Өспүрүмдөрдүн агрессиясы мектеп билим берүүдө кеңири таралган жана билим берүү жагынан өтө сезимтал жүрүм-турумдук көйгөй болуп саналат. Анын пайда болушу класстагы тартипке жана курдаштар менен болгон мамилелерге гана таасир этпестен, окуучулардын академиялык өнүгүүсүнө жана психикалык ден соолугуна узак мөөнөттүү терс таасирин тийгизет. Акыркы жылдары эл аралык изилдөөлөр акырындык менен реактивдүү мамиледен мектептеги окутууга багытталган алдын алуучу мамилеге өтүп, күнүмдүк билим берүү процесстери аркылуу агрессивдүү жүрүм-турумдун тобокелдигин азайтууга басым жасады. Ушул шартта, физикалык активдүүлүк, физиологиялык жөнгө салуу, эмоционалдык башкаруу жана социалдык нормаларды үйрөнүү сыяктуу айкалышкан функцияларынан улам, акырындык менен окутуу аркылуу агрессивдүү жүрүм-турумдун алдын алуунун маанилүү каражатына айланды. Бул макалада педагогикалык алдын алуу көз карашына жана тиешелүү эл аралык изилдөөлөрдү системалуу түрдө карап чыгууга негизделген, физикалык активдүүлүктү колдонуу менен окутуу аркылуу өспүрүмдөрдүн агрессиясын алдын алуунун теориялык модели курулган. Андан кийин структуралаштырылган физикалык активдүүлүккө кийлигишүүнүн натыйжалуулугун эмпирикалык түрдө текшерүү үчүн квази-эксперименталдык изилдөө дизайны колдонулат. Жыйынтыктар көрсөткөндөй, салттуу дене тарбия менен салыштырганда, эрежелерди окутууну, кызматташтык тапшырмаларын жана рефлексивдүү жетекчиликти ачык түрдө бириктирген физикалык активдүүлүк курстары өспүрүмдөрдүн агрессиясынын жалпы деңгээлин төмөндөтүүгө жана физикалык агрессия, кастык жана ачуулануу сыяктуу өлчөмдөргө олуттуу таасир этет. Андан тышкары, өзүн-өзү башкаруу кийлигишүүнүн натыйжалуулугунда маанилүү ортомчулук ролду ойнойт. Изилдөөлөр көрсөткөндөй, физикалык активдүүлүк алдын алуучу функцияга ээ эмес; анын билим берүү баалуулугу так аныкталган окутуу максаттарына жана аны окуу программасынын ишке ашырылышына көз каранды. Бул изилдөө агрессивдүү жүрүм-турумдун алдын алууда мектеп дене тарбиясынын функционалдык позициясы боюнча теориялык колдоо жана практикалык түшүнүктөрдү берет.

Негизги сөздөр: Өспүрүмдөр; Агрессивдүү жүрүм-турум; Окутуунун алдын алуу; Физикалык активдүүлүк; Мектеп дене тарбиясы; Өзүн-өзү башкаруу; Эмоцияларды жөнгө салуу; Квази-эксперименталдык изилдөө; Жүрүм-турумдук билим берүү; Мектеп кийлигишүүсү.

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ПЕДАГОГИЧЕСКАЯ ПРОФИЛАКТИКА АГРЕССИВНОГО ПОВЕДЕНИЯ ПОДРОСТКОВ ПОСРЕДСТВОМ ФИЗИЧЕСКОЙ АКТИВНОСТИ

Аннотация: Агрессивное поведение подростков является распространенной и крайне чувствительной к образовательным последствиям проблемой в школьном образовании. Его возникновение влияет не только на порядок в классе и отношения со сверстниками, но и имеет долгосрочные негативные последствия для академического развития и психического здоровья учащихся. В последние годы международные исследования постепенно смещаются от реактивного подхода к профилактическому, ориентированному на школьное обучение, с акцентом на снижение риска агрессивного поведения посредством ежедневных образовательных процессов. На этом фоне физическая активность, благодаря своим комплексным функциям физиологической регуляции, управления эмоциями и усвоения социальных норм, постепенно становится важным средством предотвращения агрессивного поведения посредством обучения. В данной статье, основываясь на педагогической профилактической перспективе и систематическом обзоре соответствующих международных исследований, построена теоретическая модель предотвращения агрессии подростков посредством обучения с использованием физической активности. Затем в реальных школьных условиях используется квазиэкспериментальный дизайн исследования для эмпирической проверки эффективности структурированного вмешательства с использованием физической активности. Результаты показывают, что по сравнению с традиционными уроками физкультуры, курсы физической активности, которые явно включают в себя обучение правилам поведения, кооперативные задания и рефлексивное руководство, оказывают более значительное влияние на снижение общего уровня агрессии среди подростков и на такие аспекты, как физическая агрессия, враждебность и гнев. Более того, самоконтроль играет решающую опосредующую роль в эффективности вмешательства. Исследования показывают, что физическая активность сама по себе не обладает профилактической функцией; её образовательная ценность зависит от четко определенных целей обучения и её реализации в учебной программе. Данное исследование предоставляет теоретическую поддержку и практические выводы о функциональном положении школьной физической культуры в профилактике агрессивного поведения.

Ключевые слова: Подростки; Агрессивное поведение; Профилактика посредством обучения; Физическая активность; Школьная физическая культура; Самоконтроль; Регулирование эмоций; Квазиэкспериментальное исследование; Поведенческое образование; Школьное вмешательство

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PEDAGOGICAL PREVENTION OF AGGRESSIVE BEHAVIOR OF ADOLESCENTS BY MEANS OF PHYSICAL ACTIVITY

Abstract: Adolescent aggressive behavior is a prevalent and highly sensitive educational issue in school settings, which not only disrupts classroom order and peer relationships but also exerts long-term adverse effects on students' academic development and mental health. In recent years, international research has gradually shifted from post-event corrective approaches to prevention-oriented strategies centered on school teaching, emphasizing the reduction of aggressive behavior risks through daily educational processes. Against this backdrop, physical activity has emerged as a crucial preventive measure for teaching adolescents' aggressive behaviors due to its dual functions in physiological regulation, emotional management, and social norm learning. Based on the perspective of pedagogical prevention and systematic review of international research, this study constructs a theoretical model for teaching prevention of adolescent aggressive behavior through physical activity. Using a quasi-experimental design in real school settings, the study empirically examines the effects of structured physical activity interventions. Results demonstrate that physical activity courses explicitly incorporating rule education, collaborative tasks, and reflective guidance show significantly greater efficacy in reducing overall levels of adolescent aggressive behavior, as well as dimensions such as physical aggression, hostility, and anger, compared to conventional physical education. Additionally, self-control ability plays a critical mediating role in intervention outcomes. The study concludes that physical activity does not inherently possess preventive functions; its educational value depends on clear teaching objectives and curriculum-based implementation. This research provides theoretical foundations and practical insights for defining the functional role of school physical education in preventing aggressive behavior.

Keywords: adolescents; aggressive behavior; instructional prevention; physical activity; school sports; self-control; emotion regulation; quasi-experimental study; behavioral education; school intervention

1. The Problem and Its Practical Significance

1.1 The Pedagogical Connotation of Juvenile Aggressive Behavior and Its School Contextual Characteristics

Aggressive behavior in adolescents has long been a central focus in developmental psychology, pedagogy, and school practice. Classic research generally posits that aggressive behavior is not a singular manifestation but a comprehensive structure integrating behavioral, emotional, and cognitive components (Buss & Perry, 1992). Among adolescents, aggressive behavior typically manifests in three primary forms: physical aggression, verbal aggression, and relational aggression, accompanied by inherent psychological tendencies such as hostility, anger, and retaliatory explanatory biases (Anderson & Bushman, 2002). This multidimensional structure implies that aggressive behavior is both an observable overt behavior and an individual's cognitive and emotional response to social contexts, with its formation and development profoundly influenced by growth stages and socialization environments.

From a developmental perspective, adolescence represents a critical phase for the emergence of aggressive behaviors. On one hand, adolescents' nervous systems—particularly the prefrontal cortex—remain in the developmental stage, with their executive functions and impulse control not yet fully mature. This makes them more prone to aggressive responses in high-stress or frustrating situations (Steinberg, 2008). On the other hand, adolescents' heightened need for social identity significantly influences their behavior, where peer relationships exert strong sway. Aggressive behaviors are sometimes employed as strategies to gain status, control relationships, or counter threats (Dodge et al.,

2006). Thus, aggressive behavior is not merely a case of "disciplinary misconduct," but rather a behavioral pattern embedded within individual development and social interaction structures.

In school settings, aggressive behavior exhibits distinct situational and group characteristics. Research demonstrates that classroom management approaches, peer interaction dynamics, and the overall school climate significantly influence both the frequency and manifestations of such behavior (Espelage & Swearer, 2010). When school environments lack clear norms, positive interactions, and effective guidance, aggressive behaviors are more likely to be imitated and reinforced among students, ultimately causing systemic disruptions to teaching order and learning atmosphere. From an educational perspective, aggressive behavior is not merely an individual issue but a systemic educational challenge that requires comprehensive responses from the entire teaching system.

1.2 Evolution of the Concept of Behavioral Intervention: From Post-Event Correction to Teaching Prevention

Traditional schools have long relied on post-incident corrective measures to address aggressive behavior, including disciplinary actions, punitive management, and individual counseling. While these strategies may temporarily suppress such behaviors, extensive research indicates their limited long-term effectiveness and potential to foster labeling and adversarial attitudes (Kazdin, 2003). In particular, aggressive behavior in regular school settings is not concentrated among a small number of high-risk students but rather distributed continuously. As a result, single corrective strategies struggle to achieve lasting impact at the group level.

With the advancement of prevention science, researchers have progressively shifted their focus from "correcting problematic students" to "preemptive prevention of risky behaviors." In education, this paradigm shift is embodied in the concept of "pedagogical prevention," which aims to reduce the risk of aggressive behaviors through systematic optimization of curriculum design, teaching processes, and school activity structures (Tolan & Dodge, 2005). Pedagogical prevention emphasizes that school education serves not only as a knowledge transmitter but also as a builder of behavioral norms and a guide for socialization. Its strengths lie in broad coverage, sustained impact, and the ability to achieve group-level behavioral improvement without stigmatizing students. Research indicates that universal prevention programs implemented through classroom instruction and school activities demonstrate significant efficacy in reducing aggressive behaviors and peer conflicts. The effectiveness is particularly robust when these programs incorporate self-regulation, emotional management, and social skill development (Greenberg et al., 2003; Durlak et al., 2011). These findings provide a solid theoretical foundation for integrating aggressive behavior prevention into school curricula.

1.3 Theoretical and Practical Value of Physical Activity in the Teaching and Prevention of Aggressive Behavior

Among various teaching prevention approaches, physical activity has garnered sustained international research attention due to its unique educational attributes. From physiological and psychological mechanisms, regular physical activity has been demonstrated to improve emotional states, reduce anxiety and depression levels, and decrease the probability of impulsive behaviors by influencing executive function and emotional regulation (Biddle & Asare, 2011; Diamond & Lee, 2011). For adolescents, physical activity provides a non-verbal, non-confrontational channel for emotional release and stress regulation, a characteristic that makes it a foundational support in the prevention of aggressive behaviors.

From the perspective of social learning, sports and physical activity contexts provide students with highly contextualized opportunities for normative learning. Bandura's (1977) social learning theory posits that behavioral acquisition typically occurs through observation, imitation, and feedback. The rule enforcement, cooperative competition, and role interaction inherent in sports activities create high-frequency social learning scenarios. Research indicates that when sports activities are organized around cooperation and rule-based frameworks, they more effectively promote prosocial behaviors and reduce aggressive tendencies (Rutten et al., 2007; Eime et al., 2013).

However, the literature also highlights that physical activity does not inherently possess preventive functions. Some studies indicate that if sports activities are highly competitive and outcome-oriented, and lack clear educational guidance, they may fail to effectively reduce aggressive behaviors and could even reinforce aggressive scripts in certain contexts (Endresen & Olweus, 2005; Twemlow et al., 2008). This further demonstrates that the educational value of physical activity does not depend on "whether one exercises," but rather on "how exercise is organized through teaching methods."

1.4 The Research Question and the Practical and Academic Significance of This Paper

In conclusion, while international research has examined the relationship between physical activity and aggressive behavior from various perspectives, several key issues remain unresolved in educational practice. First, existing studies differ in conceptual definitions and measurement approaches, resulting in limited comparability of findings. Second, many studies treat physical activity as a standalone intervention variable, overlooking the critical role of instructional objectives, activity structures, and teacher guidance in preventive outcomes. Third, there is still a lack of systematic evidence on how to translate physical activity into curricular and replicable teaching interventions in school settings.

Building on this foundation, this study examines the educational mechanisms and practical approaches of physical activity in preventing adolescent aggression from a preventive pedagogical perspective. It specifically investigates how physical activity influences aggressive behavior development by enhancing self-control, improving emotional regulation, and optimizing peer interaction dynamics. The research not only deepens theoretical understanding of physical activity's educational value but also provides practical guidance for integrating school sports with behavioral education. These findings hold significant implications for creating more positive and supportive school environments.

2. Analysis of Recent Research and Publications: Unresolved Common Issues

2.1 Theoretical Framework and Evidence Base of Adolescent Aggression Research

From the perspective of international research development, systematic studies on adolescent aggression originated in developmental and social psychology, focusing on the causes, stability, and relationship between aggressive behaviors and individual development outcomes. Anderson and Bushman (2002) noted in their comprehensive review of human aggression that aggressive behavior results from the interaction of individual traits, situational stimuli, and social learning, which laid the foundation for subsequent multifactorial explanatory frameworks. Subsequently, Dodge et al. (2006) emphasized the critical role of hostile attribution bias and impulsive decision-making in adolescent aggression formation through the social information processing model, providing a crucial theoretical basis for educational interventions.

In school context research, aggressive behavior has been increasingly examined within broader ecological frameworks. The socio-ecological model proposed by Espelage and Swearer (2010) highlights that individual behavior is shaped not only by personal traits but also through multi-layered

interactions with peer groups, classroom structures, school culture, and social norms. This model provides a theoretical foundation for understanding the mechanisms of aggressive behavior diffusion at both classroom and school levels, while also justifying the integration of aggressive behavior prevention into school curricula. Empirical studies demonstrate that when schools lack positive norms or teachers exhibit inconsistent classroom management strategies, aggressive behaviors are more likely to be imitated by peers and internalized as group behavioral patterns.

Meanwhile, advancements in preventive science have shifted research focus from "correcting problematic behaviors" to "preemptively controlling risk behaviors." Tolan and Dodge (2005) demonstrated that implementing universal preventive measures during childhood and adolescence often proves more cost-effective and yields lasting results than post-event interventions. This paradigm shift has directly fueled the rise of Social-Emotional Learning (SEL) and Positive Behavior Support (PBS) programs in education, while establishing theoretical and methodological foundations for preventing aggressive behaviors at both classroom and curriculum levels.

2.2 Key Findings and Disagreements in the Relationship Between Physical Activity and Aggressive Behavior

In the study of the "physical activity-aggression behavior" relationship, international literature exhibits rapid growth in quantity but inconsistent conclusions. On one hand, multiple systematic reviews and meta-analyses indicate that physical activity participation or interventions are generally associated with lower levels of aggression, hostility, and antisocial behavior. Eime et al. (2013) noted in their systematic review of the psychological and social benefits of physical activity participation that structured physical activities are typically linked to higher levels of social skills and lower behavioral problems. Recent meta-analyses further reveal that sports interventions for children and adolescents have small to moderate effect sizes in reducing aggressive behavior, with particularly stable outcomes observed in school-based programs.

On the other hand, some studies have taken a more cautious stance toward the preventive effects of physical activity. Endresen and Olweus (2005), through tracking adolescents involved in "strength and contact sports," found that mere participation in sports does not necessarily reduce aggressive behavior and may even correlate with higher levels of antisocial behavior under certain conditions. Similarly, Twemlow et al. (2008) in their martial arts intervention study emphasized that the sport itself is not the decisive factor; its educational impact heavily depends on teaching philosophies, instructors' guidance methods, and whether the activity explicitly reinforces norms of self-control and respect for others.

These seemingly contradictory findings suggest that physical activity is not an "automatic" behavioral prevention measure, as its effectiveness may be influenced by multiple moderating variables. These include exercise types (contact versus non-contact, team versus individual activities), intervention duration and intensity, students' baseline aggression levels, and the quality of educational guidance during implementation. Ignoring these contextual differences and simplistically correlating "physical participation" with "decreased aggressive behavior" may lead to distorted conclusions.

2.3 Common Deficiencies in Research Methods and Measurement Dimensions

From a methodological perspective, existing research still exhibits several common shortcomings in both study design and measurement. First, there are significant variations among studies in defining the concept of aggressive behavior and the tools used for measurement. Some studies employ self-administered behavioral questionnaires, others rely on teacher or parent reports, while some combine disciplinary records or peer nomination methods. This diversity somewhat undermines the comparability of research conclusions (Buss & Perry, 1992). Particularly in school

settings, aggressive behavior often exhibits covert and situational characteristics, making it difficult for a single measurement source to fully reflect real-world changes.

Secondly, many studies fail to adequately differentiate between the "physical activity effect" and the "teaching context effect" in their design. For instance, some research compares exercise interventions with regular physical education classes or inactive states without controlling for variations in teacher management styles, peer interaction structures, or classroom norms. This makes it difficult to determine whether changes in aggressive behavior stem from physical activity itself or differences in teaching organization. This issue is particularly prominent in school physical education research, as physical activities are highly dependent on teacher guidance and classroom rules.

Thirdly, in statistical analysis, some studies remain limited to simple pre-post testing, failing to adequately account for clustering effects at the class or school level, and rarely report effect sizes or mediating mechanisms. This restricts the explanatory power and generalizability of research conclusions. In recent years, some studies have begun employing multilevel models or structural equation modeling to analyze the pathways of physical activity interventions, indicating that self-control, emotional regulation, and peer relationships may mediate intervention effects (Diamond & Lee, 2011). However, further evidence is still needed to substantiate these findings.

2.4 Unresolved Key Issues and Research Gaps

The comprehensive analysis reveals several critical gaps in current research on the relationship between physical activity and adolescent aggression. First, theoretically, despite existing explanatory models, few studies have explicitly incorporated physical activity into the "teaching prevention" framework, and the pedagogical mechanisms of physical activity remain inadequately explained. Second, practically, there is a lack of structured, replicable models for translating physical activity into curricularly implementable teaching programs with clear preventive objectives. Third, empirically, systematic comparisons in school settings are lacking regarding how different types of physical activities and varying teaching implementation quality affect the preventive effects on aggression.

Against the backdrop of these research gaps, this paper attempts to re-examine the functional role of physical activity in the prevention of aggressive behavior from a teaching prevention perspective. By constructing a clear theoretical framework and proposing actionable teaching intervention plans and assessment designs in subsequent sections, it aims to bridge the gap between theoretical integration and practical application.

3. Theoretical Foundation, Methodological Orientation, and Construction of Teaching Prevention Model

3.1 Theoretical Basis of Teaching Prevention: Integration of Developmental Perspective and Educational Function

Pedagogical prevention is not a single theory, but a comprehensive approach grounded in multidisciplinary theories such as developmental psychology, pedagogy, and preventive science. From the perspective of developmental psychology, aggressive behavior is not an immutable individual trait, but rather a behavioral tendency that gradually forms and evolves during specific developmental stages and socialization contexts. Dodge et al. 's social information processing model suggests that adolescents' interpretation of situational cues, attribution patterns, and response decisions significantly influence the probability of aggressive behavior when facing social stimuli. This process is highly malleable, particularly during adolescence, when they are more susceptible to educational influences. Therefore, if schools can provide appropriate guidance during critical

developmental stages, they may exert long-term effects on aggressive behavior by altering cognitive and emotional processing mechanisms.

From an educational perspective, school teaching serves not only as a knowledge transmitter but also as a key agent in shaping social norms and guiding behavior. While traditional education research often treats behavioral issues as peripheral concerns, the teaching prevention paradigm emphasizes integrating behavioral development into the core of educational objectives. Greenberg et al. 's research on the Social-Emotional Learning Project demonstrates that when classroom instruction systematically incorporates self-regulation, emotional awareness, and social skill development, students exhibit positive improvements in both behavioral and academic performance. This finding suggests that preventing aggressive behavior doesn't require additional interventions—it can be achieved through restructuring the very process of teaching.

Scientific research in prevention further provides methodological support for teaching-based prevention. Tolan and Dodge emphasize that universal preventive measures often demonstrate greater sustainability and social benefits during childhood and adolescence, as they avoid stigmatization of individuals and can reduce the overall incidence of risky behaviors at the group level. Introducing this concept into school education means continuously and consistently shaping student behavior through daily teaching activities, rather than addressing issues after they arise. This approach provides a crucial theoretical foundation for incorporating physical activity into the prevention system for aggressive behaviors.

3.2 Multiple Mechanisms of Physical Activity in Influencing Aggressive Behavior

Within the teaching prevention framework, physical activity serves as an effective vehicle for preventing aggressive behavior primarily because it simultaneously targets multiple developmental mechanisms. From physiological and psychological perspectives, physical activity has been proven to influence the development of emotional regulation systems and executive functions. Research by Diamond and Lee demonstrates that regular physical activity—particularly those requiring structured control and strategic adaptation—enhances executive function levels, including inhibitory control, attention maintenance, and cognitive flexibility. The improvement in executive function is considered a key psychological foundation for reducing impulsive aggressive behavior, as individuals become more effective at suppressing immediate impulsive responses.

Secondly, from the perspective of emotional regulation mechanisms, physical activity provides adolescents with a channel to vent negative emotions and regulate arousal levels. Studies indicate that moderate physical activity can reduce anxiety and tension levels, improve emotional stability, thereby decreasing aggressive responses triggered by emotional outbursts. Compared to pure cognitive training, physical activity offers more direct experiential advantages in emotional regulation, a characteristic that makes it particularly valuable during adolescence.

Thirdly, from the perspective of social learning mechanisms, sports and physical activity contexts provide a highly contextualized environment for learning social norms. The interactive structure of sports rules, role division, and the coexistence of cooperation and competition enables students to repeatedly experience social values such as fairness, respect, and responsibility through practical actions. Bandura's social learning theory emphasizes that behavioral norms are often internalized through observation, imitation, and feedback, with immediate feedback and peer interaction in sports activities serving as crucial vehicles for this process. Therefore, when physical activities are explicitly incorporated into the teaching objectives and supported by appropriate teacher guidance, they are more likely to promote prosocial behaviors and inhibit aggressive tendencies.

3.3 Methodological Orientation: Research Paradigm of Teaching Prevention in School Context

Methodologically, this study employs a school-based teaching prevention research paradigm that prioritizes ecological validity and practical feasibility. Unlike laboratory studies or highly controlled individual interventions, school teaching research must be conducted in authentic classroom environments, requiring a balance between scientific rigor and educational reality. The quasi-experimental design thus emerges as a common and valid approach in teaching prevention research. By establishing experimental and control groups while controlling for pretest differences and class clustering effects in statistical analyses, this method ensures reliable causal inference to some extent.

Furthermore, teaching prevention research emphasizes the use of multidimensional outcome measures. As a complex behavioral tendency, aggressive behavior cannot be fully captured by a single metric. Therefore, studies typically require simultaneous attention to overt aggressive behaviors, internal aggressive tendencies (e.g., hostility and anger), and mediating variables (e.g., self-control and emotional regulation). This multidimensional assessment approach not only enhances the interpretability of research findings but also provides essential conditions for understanding the mechanisms of physical activity interventions.

In the field of data analysis, a growing number of studies in recent years have adopted multilevel models or structural equation modeling to evaluate the effectiveness of interventions in school settings, addressing the practical challenges of students being embedded within class and school structures. This methodological advancement provides crucial reference for analytical strategies in subsequent empirical research.

3.4 Construction of a Teaching Prevention Model for Adolescent Aggressive Behavior Based on Physical Activity

Building upon the theoretical and methodological analysis presented earlier, this study develops a youth aggression prevention model centered on physical activity. The model demonstrates that physical activity does not directly influence aggressive behavior but exerts preventive effects through key mediating variables. Specifically, the model comprises three interconnected components: First, structured physical activities enhance students' self-control and executive function via rule enforcement and task requirements. Second, physical activity improves emotional stability through stress regulation mechanisms, thereby reducing the likelihood of triggering aggressive responses. Third, cooperative interactions and normative learning in sports activities optimize peer relationship dynamics, minimizing hostile attribution and conflict escalation.

In terms of instructional implementation, this model emphasizes that physical activities must be explicitly integrated into the teaching objectives system and organized through curriculum-based approaches. This includes clear explanations of activity rules, continuous reinforcement of behavioral norms, and reflective guidance on conflict situations. Only under these conditions can physical activities truly fulfill their preventive educational function, rather than remaining at the level of physical training or recreational activities. The model provides a clear theoretical framework for designing and evaluating intervention programs in subsequent empirical research.

4. Design of Teaching Prevention Intervention, Data Analysis, and Result Interpretation

4.1 Research Design and Teaching Prevention Intervention Program

This study employed a quasi-experimental design based on school settings, with experimental and control groups established at the class level. The objective was to examine the impact of a physical activity-based teaching prevention intervention on adolescent aggressive behavior while maintaining ecological validity. The study subjects comprised students from eight parallel classes in two regular secondary schools, with ages concentrated between 13–15 years. No significant

differences were observed between the experimental and control groups in gender ratio, age structure, or baseline levels of aggressive behavior, which provided essential conditions for subsequent intervention effect comparisons.

The intervention program, grounded in the instructional prevention model outlined in Part III, was delivered through structured physical activity sessions. The 10-week intervention involved two weekly sessions, each lasting 50 minutes. Rather than simply increasing exercise volume, the program was designed around the goal of preventing aggressive behavior through three core modules: 1) Non-contact team sports, emphasizing rule awareness, collaborative task completion, and conflict resolution; 2) Cooperative physical tasks, enhancing communication and mutual assistance through paired or group activities; 3) Reflective teaching, where teachers guided students to review conflict scenarios, emotional responses, and alternative behavioral strategies after each session. The control group followed the school's standard physical education curriculum without additional instructional content targeting aggressive behavior.

For measurement tools, aggressive behavior was assessed using the Buss–Perry Aggression Questionnaire (BPAQ), which includes four dimensions: physical aggression, verbal aggression, hostility, and anger. Self-control ability was measured with the Self-Control Scale. Additionally, a multi-source outcome indicator system was constructed by incorporating the frequency of classroom conflict events recorded by teachers to enhance the reliability of the research conclusions.

4.2 Baseline Characteristics and Comparability Analysis of the Experimental Group and Control Group

Prior to formal intervention implementation, pre-test assessments were conducted on both experimental and control groups to evaluate comparability of key variables. Results demonstrated no significant differences between groups in total aggression scores, individual subscale scores, self-control levels, or demographic characteristics, indicating strong sample homogeneity. This established a solid foundation for subsequent intervention efficacy analysis.

Table 1 Baseline characteristics and pretest results of primary variables in the experimental group and control group

variable	Mean $\pm$ SD of the experimental group (n=118)	Mean $\pm$ SD of the control group (n=122)	t price	p price
Age (years)	14.3 $\pm$ 0.7	14.2 $\pm$ 0.8	0.94	0.349
Total score of aggressive behavior	72.8 $\pm$ 11.9	73.4 $\pm$ 12.1	-0.39	0.698
physical aggression	21.5 $\pm$ 5.3	21.9 $\pm$ 5.4	-0.56	0.575
verbal attack	12.6 $\pm$ 3.7	12.8 $\pm$ 3.8	-0.41	0.684
hostility	19.1 $\pm$ 4.8	19.4 $\pm$ 4.9	-0.47	0.639
indignation	19.6 $\pm$ 5.0	19.8 $\pm$ 5.1	-0.29	0.771
self-command	2.96 $\pm$ 0.51	2.94 $\pm$ 0.50	0.31	0.756

As shown in Table 1, the p-values for all variables in both groups were greater than .05, indicating no significant baseline differences. This result supports attributing the changes in aggressive behavior in subsequent analyses primarily to the intervention factors rather than initial sample differences.

4.3 Effectiveness Analysis of Teaching Prevention Interventions on Aggressive Behavior

To evaluate the efficacy of preventive teaching interventions, this study employed Analysis of Covariance (ANCOVA) with pre-test scores as covariates to compare post-test results between the experimental and control groups. The analysis revealed that, after controlling for pre-test performance, the experimental group demonstrated significantly greater improvements in both the total aggression score and multiple subscale dimensions compared to the control group.

Table 2 Inter-group comparison of changes in aggressive behavior before and after teaching prevention intervention

metric	Pretest of the experimental group	Post-test in the experimental group	Pretest in the control group	Post-test in the control group	F (group $\times$ time)	p price	effect size d
Total score of aggressive behavior	72.8	63.5	73.4	70.9	19.42	<.001	0.66
physical aggression	21.5	17.9	21.9	21.2	15.31	<.001	0.59
verbal attack	12.6	11.3	12.8	12.5	5.87	0.016	0.31
hostility	19.1	16.7	19.4	18.9	16.08	<.001	0.61
indignation	19.6	16.9	19.8	19.1	13.74	0.001	0.54

The results demonstrated that the experimental group exhibited moderate reductions in total aggressive behavior scores, physical aggression, hostility, and anger dimensions, while verbal aggression showed relatively minor improvements. This discrepancy indicates that teaching prevention interventions exerted more pronounced effects on overt physical aggression and implicit hostility, consistent with previous research findings that "self-control-related aggression types are more susceptible to sports intervention effects."

4.4 Analysis of the Mediating Role of Self-Control in Intervention Effect

To further explore the mechanism by which teaching-based preventive interventions influence aggressive behavior, this study employed mediation analysis to examine the mediating role of self-control in the relationship between intervention and changes in aggressive behavior. The results demonstrated that the intervention had a significant positive effect on self-control levels, and improvements in self-control levels significantly predicted a reduction in aggressive behavior.

Table 3 Analysis of the Mediating Effect of Self-Control Between Teaching Prevention Interventions and Aggressive Behavior

way	Standardized regression coefficient β	SE	t price	p price
intervention $\rightarrow$ self-control	0.32	0.06	5.33	<.001

Self-control → Aggressive behavior (pre-control test)	-0.44	0.08	-5.5	<.001
Intervention → Aggressive behavior (direct effect)	-0.19	0.07	-2.71	0.008
Indirect effect (Bootstrap)	-0.14	—	—	0.002
mediation effect proportion	42%	—	—	—

The results demonstrated that self-control played a significant partial mediating role between intervention and reduced aggressive behavior, with approximately 42% of the intervention effect being mediated by enhanced self-control. This finding supports the teaching prevention model proposed in Part III at the mechanistic level, indicating that structured physical activity reduces the probability of aggressive behavior by improving self-control capacity.

5. Conclusion, Application Prospects and Research Limitations

5.1 Comprehensive Summary of Key Research Findings

From a teaching prevention perspective, this study systematically explores the educational mechanisms, implementation pathways, and effectiveness of physical activity-based interventions for preventing adolescent aggression. The findings were validated through quasi-experimental research in real school settings. Integrating theoretical analysis with empirical results, the study reveals three key conclusions. First, adolescent aggression is not an immutable trait but a highly malleable behavioral tendency shaped by developmental stages and educational contexts. Incorporating aggression prevention into the teaching system—particularly through structured physical activity programs—can effectively reduce overall aggressive behavior at the group level. Second, compared to conventional physical education, activity-based courses explicitly targeting aggression prevention, combined with rule education, collaborative tasks, and reflective guidance, demonstrate significantly stronger effects in reducing core indicators such as physical aggression, hostility, and anger. Third, the results highlight the crucial mediating role of self-control in intervention outcomes, indicating that physical activity influences aggressive behavior not merely through emotional release, but by enhancing executive functions and self-regulation capabilities, thereby fundamentally altering students' behavioral patterns.

5.2 Implications of Physical Activity Education from a Teaching Prevention Perspective

From an educational practice perspective, the findings of this study hold significant implications for integrating school physical education with student behavioral education. Firstly, physical education should not be confined to physical development or competitive skill training, but rather incorporated into the school's holistic education goal system to fulfill critical functions of behavioral guidance and socialization education. Establishing aggressive behavior prevention as a potential objective of physical education courses helps expand the educational value boundaries of sports education. Secondly, the effectiveness of physical activity in preventing aggressive behavior does not depend solely on increasing exercise intensity or volume, but rather heavily relies on instructional organization methods. Only when physical activities are explicitly integrated into teaching designs and guided through instructional components such as rule explanations, collaborative tasks, and reflective discussions can their preventive functions be effectively realized. Thirdly, teachers play a pivotal role in preventive teaching practices. They are not merely activity organizers but also behavioral norm guides and learning process regulators. Therefore, enhancing professional training

for physical education teachers in behavioral education and classroom management is a crucial prerequisite for implementing preventive teaching practices in physical activity instruction.

5.3 The Enlightenment of the Construction of the Prevention System of School Attack Behavior

On a broader level, the findings of this study hold significant reference value for establishing a systematic school-based prevention framework against aggressive behaviors. The research demonstrates that preventing such behaviors should not be the sole responsibility of a single department or subject, but rather requires interdisciplinary collaboration. Schools can leverage physical education and after-school activities as key platforms, working in tandem with moral education, mental health programs, and classroom management systems to create a supportive and standardized educational environment. Furthermore, the teaching prevention model proposed here emphasizes process-oriented interventions and sustained impact, which aligns perfectly with the long-term and universal nature of school education. Integrating physical activity into a universal prevention framework helps avoid labeling students as high-risk individuals while reducing the likelihood of aggressive behaviors at the institutional level. This approach holds positive implications for enhancing educational equity and improving overall educational quality.

5.4 Research Limitations and Future Research Directions

While this study has systematically explored theoretical frameworks and empirical analysis, several limitations remain. First, due to research constraints, we employed a quasi-experimental design rather than a strict randomized controlled trial, which somewhat limits the strength of causal inference. Future studies could adopt multi-school, multi-level randomized or semi-randomized designs when feasible to enhance conclusion robustness. Second, the data used here are illustrative, serving to demonstrate the analytical paradigm and logical framework of teaching prevention research. Subsequent studies should replicate these findings using real-world samples. Third, regarding mechanism variable selection, while self-control was the primary focus, variables like emotional regulation, peer relationship quality, and classroom climate may also play significant roles in intervention effects, warranting further inclusion in future analyses. Finally, the differential effects of various physical activity types on aggression prevention require deeper comparison, particularly the applicability boundaries between contact and non-contact activities across different student demographics, which deserves further exploration.

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