# Impact of adapted physical education and para-athletics on the mental skills and inclusion of adolescents with disabilities

*Impacto de la educación física adaptada y el paraatletismo en las habilidades mentales y la inclusión de adolescentes con discapacidades*

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## Abstract

Introduction: This study examines the influence of the integration of two adapted programs (adapted physical education and para-athletics) on the mental abilities and of motor-disabled students.
Objective: The objective is to identify strategies to promote effective inclusion in educational environments, particularly in physical education.
Methodology: The study was conducted with 96 pupils with motor disabilities (14-18 yrs), enrolled in public schools in Morocco. In accordance with the provisions stipulated by the Para Athletics classification, the categorization of disability classes was divided into three distinct groups. The participants were randomly divided into 3 groups. The 1st group(control) does not possess a defined program; in the 2nd group, subjects followed an APE program comprising 24 sessions over a 3-month period. The 3rd group benefited from the same APE-para-athletics program (24 sessions) and inclusive competitions. Assessments were conducted before and after the intervention. The OMSAT-4 Mental Ability Scale and the Sense of School (SSIS) Pedagogical Inclusion (SPIS) were employed for the assessment of the participants.
Results: The control-group demonstrated no statistically significant change, with some variables exhibiting a decline. The APE-program yielded significant improvements in basic skills, including commitment (+50.16%), as well as psychosomatic skills such as stress reaction (+35.67%). The group that received the APE-Para-athletics combination exhibited the most notable outcomes (p<.05), displaying a pronounced enhancement in all competencies, including stress reaction (+84.39%) and concentration (+75.44%).
Conclusions: The integration of APE-Para-athletics programs has been demonstrated to significantly enhance the mental skills and sense of inclusion of motor-disabled students.

## Keywords

Psychological skills, cognitive skills, stress reaction, para-sport, well-being.

## Resumen

Introducción: Este estudio examina la influencia de la integración de dos programas adaptados (educación física adaptada y para-atletismo) en las capacidades mentales y de los alumnos con discapacidad motora.
Objetivo: El objetivo es identificar estrategias para promover la inclusión efectiva en entornos educativos, particularmente en educación física.
Metodología: El estudio se realizó con 96 alumnos con discapacidad motriz (14-18 años), matriculados en escuelas públicas de Marruecos. De acuerdo con las disposiciones estipuladas por la clasificación de Para Atletismo, la categorización de las clases de discapacidad se dividió en tres grupos distintos. Los participantes se dividieron aleatoriamente en 3 grupos. El 1º grupo (control) no posee un programa definido; en el 2º grupo, los sujetos siguieron un programa de APE que comprendía 24 sesiones a lo largo de un periodo de 3 meses. El 3er grupo se benefició del mismo programa APE-paratletismo (24 sesiones) y competiciones inclusivas. Se realizaron evaluaciones antes y después de la intervención. Para evaluar a los participantes se utilizaron la escala de capacidad mental OMSAT-4 y las escalas de inclusión (SPIS).
Resultados: El grupo de control no mostró cambios estadísticamente significativos, y algunas variables mostraron un descenso. El programa APE produjo mejoras significativas en las habilidades básicas, incluido el compromiso (+50,16%), así como en habilidades psicosomáticas como la reacción al estrés (+35,67%). El grupo que recibió la combinación APE-Para-atletismo exhibió los resultados más notables (p<.05), mostrando una mejora pronunciada en todas las competencias, incluyendo la reacción al estrés (+84.39%) y la concentración (+75.44%).
Conclusiones: Se ha demostrado que la integración de los programas APE-Para-atletismo mejora significativamente las habilidades mentales y el sentido de inclusión de los alumnos con discapacidad motora.

## Palabras clave

Habilidades psicológicas, habilidades cognitivas, reacción al estrés, bienestar para-deportivo.

## Introduction

A review of existing literature reveals that including disabled students (SD) in various societal contexts is conducive to the advancement of equal opportunities and human rights (UNESCO, 2021). Education provides students with the opportunity for personal and social development, irrespective of their disability status (WHO, 2020). In this regard, the inclusion in physical education and sports (PES) classes presents a duality of challenges and opportunities. On the one hand, overcoming this significant hurdle is necessary. On the other hand, it offers a distinctive opportunity to enhance physical and psychological well-being (Ben Rakaa et al., 2025b). The pedagogical approach of integrating physical exercise within the framework of adapted physical education (APE) enables the fulfillment of students' educational requirements (Ben Rakaa et al., 2025a), thereby enhancing their physical capabilities and fostering self-assurance (Velde et al., 2018). The APE's approach extends beyond mere physical improvements, promoting mental, psychological, and social development collectively, thereby contributing to the overall fulfillment of individuals (Ben Rakaa et al., 2025a; Blauwet & Willick, 2012). In a school context, APE enables students with disabilities to become actively involved in physical education classes, which are a crucial part of their overall educational experience (Bertills & Björk, 2024). The efficacy of APE programs is contingent upon the caliber of teaching and the availability of resources, in addition to the commitment of educators. APE is tailored to meet the unique needs of disabled students, ensuring their participation in PAs. APE involves modifying activities to accommodate different abilities, thereby fostering an inclusive environment. APE's overarching objective is to enhance physical fitness, overall well-being, and social integration, as evidenced by numerous studies (Bertills & Björk, 2024; Claire, 2025). A study was conducted to compare three neuro-pedagogical methods: contextualization of learning, memory maps, and focusing on the essentials. The findings indicated that each of these methods resulted in a notable enhancement in student performance. Contextualization serves to reinforce the links between new knowledge and lived experience. Memory maps facilitate active memorization and error correction.

Focusing on the essentials serves to reduce cognitive overload. The study posits that the combination of these methods could optimize learning by addressing the heterogeneous cognitive requirements of students (Elouafi et al., 2023).

The implementation of training programs for educators in the field of Applied Behavior Analysis (ABA) provides the opportunity to establish an inclusive learning environment that is conducive to academic growth and development (Linhares & Vargas, 2024). The combination of APE with participation in Paralympic sports, such as wheelchair basketball, sitting volleyball, and para-athletics, has been demonstrated to facilitate the growth of mental abilities in students with disabilities. These include concentration, stress reaction, and motivation, which are not only crucial for attaining optimal athletic performance but also for ensuring academic success and navigating daily life (Martín-Rodríguez et al., 2024; Zhang et al., 2024). The assessment of students' physical abilities commences in early childhood and encompasses the tracking, monitoring, and screening for motor delays, in addition to the examination of the child's and family's knowledge, motivation, and sentiments regarding PA (Lobelo et al., 2020). In light of these considerations, several organizations have developed resources to facilitate the inclusion of disabled students (Direction des Curricula, 2019b, 2019c, 2019a, 2019d). A study has demonstrated that students who regularly engage in APE programs exhibit a notable enhancement in their psychological resilience and self-esteem (Liu et al., 2021). In particular, para-athletics provides students with a distinctive opportunity to engage in intellectually stimulating activities, establish attainable objectives (Pérez-Torralba et al., 2019), and cultivate cognitive abilities to surmount physical and emotional challenges (Van De Vorst et al., 2023).

The incorporation of sports into the academic curriculum has been demonstrated to foster competitiveness and self-transcendence, thereby enhancing students' capacity to maintain focus and determination (Kang et al., 2024). Other domains of their lives can apply these competencies (Kang et al., 2024). The advantages of APE and para-athletics go beyond just sports performance, offering various benefits that help improve mental health, social skills, and emotional challenges faced by students with disabilities. Indeed, students who engage in these activities report a reduction in symptoms of anxiety and depression, as well as an enhanced capacity for emotional regulation (Eime et al., 2013). It is of particular importance to consider the psychological benefits of these improvements for students with motor disabilities, who may face additional difficulties such as social stigmatization and feelings of isolation (Sammon

et al., 2020). A review of extant literature indicates that disabled students encounter a plethora of social, physical, and educational challenges that impede their involvement in adapted sports activities. It is evident that disabled students encounter a plethora of social, physical, and educational barriers that impede their involvement in conventional sports activities (Alves et al., 2018).

Despite the numerous benefits of APE programs and para-athletics on mental well-being and social inclusion that have been highlighted by extant research, several gaps in the literature persist. Firstly, the precise mechanisms by which these programs improve psychological skills and enhance the sense of educational inclusion in adolescents with motor disabilities remain poorly understood. Secondly, there are not many studies looking at how well programs that combine APE and para-athletics work compared to those that are separate, especially in different school settings or for students with different levels of disabilities. In an educational system where the inclusion of motor-disabled students remains a challenge, the mere inclusion of these students within the class group does not guarantee their feelings of pedagogical and school inclusion as long as they are not the primary actor in their sports practice and learning. In light of the aforementioned considerations, the objective is to investigate the influence of integrating two APE programs and para-athletics within a PE framework on the mental abilities and the perception of school and pedagogical inclusion of students with motor disabilities and also to identify strategies that can be implemented in inclusive educational environments to optimize the benefits of such inclusion.

## Method

### *Participants*

We conducted this research on a cohort of N=96 motor-disabled adolescents (14-18 years) enrolled in Moroccan public schools. The sample comprised 35% of participants residing in rural areas and 65% in urban settings. Inclusion criteria required that participants be integrated into regular classrooms alongside their able-bodied peers, possess an official disability certificate issued, and hold a medical certificate confirming their physical ability to engage in PE classes. Informed consent was obtained from parents or legal guardians regarding both participation in the study and the dissemination of findings. To ensure ethical conduct in this research involving disabled minors, authorizations were obtained from the Regional Directorate of the Ministry of National Education (No. 3656/23) and the Ministry of Health in Beni Mellal-Khenifra (No. 3528/23). Prior to inclusion, participants underwent classification based on the IPC system (2016), conducted by volunteer specialists in the field.

### *Procedure*

The present study adopted the methodology of a randomized controlled trial (RCT) to evaluate the effects of 2 APA programs.

The initial program was solely the APE program; however, the subsequent one employed a hybrid strategy incorporating APE and Paralympic athletics. To mitigate selection bias, individuals were randomly allocated into three separate groups. The initial control group did not adhere to any particular regimen. The second group (APE) engaged in a program solely focused on adapted physical education, consisting of 2 weekly sessions of one hour each for a duration of three months. The third group (APE+Paraathletics) adhered to the same regimen as the second group, with the inclusion of two additional 1.30-hour sessions per week dedicated to Paralympic athletics. Furthermore, the aforementioned group engaged in inclusive school sports at provincial, regional, and national tiers under the para-athletics discipline.

We have carefully crafted the APA program to meet the distinct requirements of kids with motor impairments. The program focuses on 2 main athletic disciplines: throwing, jumping, or running.

The program has two main goals: first, it aims to help people learn and share educational content related to APE cycles; second, it focuses on including students with physical disabilities in school sports. It is carefully designed to support various motor challenges, such as brain injuries, amputations, and spinal cord injuries, with the main aim of encouraging active participation in physical education and eventually helping them join competitive sports. In this way, the program has two main goals: it is carefully made to help people with different motor challenges, like brain injuries, amputations, and spinal cord injuries,

with the main aim of encouraging them to take part in physical education classes and eventually helping them get involved in competitive sports.

Within the context of their PE instruction, educators have devised learning cycles under the umbrella of an APA. The program 's dualistic objective is twofold, meticulously customized to cater to the needs of students grappling with motor deficiencies. Therefore, we established para-athletics training sessions to improve athletic performance and encourage student involvement in inclusive school sports.

Three phases make up the program: the first is initiation, the second is development, and the third is consolidation. The intensity of the program's dualistic objective is twofold: it is progressively adjusted to align with the students' individual abilities, ensuring a tailored and personalized approach to their physical activity. As students progress, regular monitoring and individualized assessments allow for the adaptation of session content. In addition, participation in inclusive events is encouraged to promote the social and physical development of students.

Phase 1: Initiation Phase (Weeks 1–4): Foundational motor skill acquisition and pedagogical tool adaptation.

Disability-Specific Interventions:

Cerebral Palsy: Mobility circuits: Wheelchair or walker navigation along a 15-meter pathway integrating 90° turns and controlled stops. Precision throws: Weighted ball throws (1 kg) toward circular targets (1 m diameter) positioned at 3-meter intervals.

Lower-Limb Amputations: Prosthetic Propulsion Drills Progressive gait training (20-meter sprints) with incremental resistance modulation via elastic bands (low-to-moderate resistance).

Spinal Cord Injuries: Trunk stabilization: Seated balance maintenance on a Swiss ball (2-minute holds), with phased reduction of manual upper-limb support.

Phase 2: Development Phase (Weeks 5–8): Technical skill consolidation and competitive strategy integration.

Dynamic Throwing Protocols: Upper-limb amputees: Discus throws (0.75 kg) with trunk stabilization via support harnesses; 6-meter target distance. Paraplegic athletes: Seated rotational throws using pivot-enabled chairs to optimize trunk range of motion.

Adaptive Locomotor Training: Wheelchair Sprints The training involves interval training (30s moderate-intensity effort, 60s recovery) over distances of 50 meters. Unilateral long jumps: Asymmetric takeoff drills on foam-matted surfaces to ensure safe landings.

Phase 3: Consolidation Phase (Weeks 9–12): Competitive skill transfer and psychosocial resilience enhancement.

Performance-Oriented Interventions—Competitive Scenario Simulations:

IPC-compliant throws: Five consecutive attempts graded per International Paralympic Committee criteria (minimum 5-meter distance for F30-F40 classifications). Inclusive relays: Mixed teams (able-bodied/disabled participants) employing ergonomic baton exchanges.

Psychophysiological Regulation: Pre-performance breathing protocols: 4-second inhalation/6-second exhalation cycles to attenuate competitive anxiety.

Supplementary Para-Athletics Training Protocol—Session Structure (APE + Para-Athletics Group):

Warm-Up (20 minutes): Joint mobilization (shoulder rotations, ankle dorsiflexion) and dynamic stretching.

Technical Drills (50 minutes): Throwing: Six sets of five repetitions with progressive load increments (1–3 kg), prioritizing kinematic fluidity. Sprinting: Asymmetry-correction drills via 30-meter stride adjustments (ground markers tailored to impairment profiles).

Debriefing (20 minutes): Reflective group analysis: Progress evaluation aligned with the Sense of Pedagogical Inclusion (SPIS) scale.

Progression Framework:

Weeks 1–4: Technical proficiency (precision > intensity).

Weeks 5–8: Intensity modulation (20% load increase, task complexity escalation).

Weeks 9–12: Competition-specificity (IPC regulatory benchmarks applied)

In both programs, a pre- and post-test were conducted, or the OMSAT-4 scales, the SPIS, and the SSIS were administered.

### *Instrument*

Mental abilities: The Ottawa Mental Skills Assessment Tool-4 (OMSAT-4) is a French-language adaptation of the original English-language version (Durand-Bush et al., 2001). The assessment tool measures a comprehensive range of mental skills, including fundamental abilities such as goal setting, commitment, and commitment. It also assesses psychosomatic skills, such as stress reaction, fear control, relaxation, and activation. Additionally, it evaluates cognitive skills, such as concentration, distraction control, mental imagery, mental practice, and competition preparation (Crépin & Delerue, 2007). The OMSAT-4 was not changed for athletes with disabilities because the mental skills it measures are considered universal, there isn't enough evidence showing major differences in these skills for this group, and adapting and validating it would require a lot of resources.

Pedagogical inclusion: The present scales, the Educational Inclusion Sentiment Scale (EIS) and the School Inclusion Sentiment Scale (SSIS), are rooted in the Norwegian adaptation of Booth's Inclusion Index. We then collected data via a face-to-face survey from a representative sample of disabled students, divided into different grade levels. A subsequent in-depth thematic analysis of the responses identified the main dimensions of the feeling of educational inclusion. The analysis yielded six SPIS items, developed using a five-level Likert scale (Ben Rakaa et al., 2025b).

School inclusion: Assessing the sense of school inclusion (SSIS), a methodology analogous to that previously employed was adopted in order to develop a specific scale made up of A total of 12 items were assessed using a 5-level Likert scale (Ben Rakaa et al., 2025b).

### *Data analysis*

We performed a descriptive analysis for all the studied variables. We then compared the pre-test and post-test results in terms of mental skills and feelings of inclusion using an ANOVA I method. When the difference between these two measures was statistically significant, the rate of change was calculated according to the following formula: ((Post – Pre) / Pre) × 100. This calculation yielded the rate of change, which was then used to analyze the data. Subsequently, a repeated measures ANOVA with Bonferroni correction was performed to examine the effect of interactions between the different variables within the three groups studied (control group, APE group, and APE+ para-athletics group). In the final stage of the analysis, Pearson's correlation test was utilized to assess the relationships between various mental skills and inclusion.

## Results

The following section provides a 3-stage analysis. Initially, descriptive data will be presented, including the mean and standard deviation of the various mental abilities and forms of inclusion measured before and after the experimental program. We will then examine the differences between the three groups of study participants (control, APE, and APE+Para-Athletics) before and after the intervention. Finally, we will present the strength of the correlations between the different variables.

### *Evolution of inclusive physical education (IPE) and mental skills before and after the test*

The table shows how different programs affect various aspects of inclusive physical education (IPE) and basic, psychosomatic, and cognitive skills, comparing measurements taken before and after the intervention. The table illustrates the mean±SD differences between the pre- and post-intervention periods for each variable. The control group demonstrated no statistically significant alterations in the majority of the observed variables. No appreciable change was observed in the basic psychosomatic and cognitive skills, including stress reaction, fear control, and concentration ($p>.05$). The sole area to demonstrate a slight improvement was that of competition preparation ($p<.05$), with an increase of 20.23%. The

adapted physical education program resulted in notable evolution in the majority of skills (p<.05). Notably, there were significant increases in the levels of proficiency demonstrated in fundamental abilities such as goal setting (+54.09%) and commitment (+50.16%). Psychosomatic abilities, such as stress reaction (+35.67%) and fear control (+33.23%), also demonstrated significant advancement, reflecting enhanced self-regulation in challenging circumstances (p<.05). Furthermore, notable enhancements were statistically improved in cognitive abilities (p<.05), including concentration (+42.04%) and distraction control (+41.21%). The APE group, in conjunction with Para-Athletics, exhibited the most notable outcomes (very significant p<.01), with discernible enhancements across all variables. Participants exhibited noteworthy enhancements in stress reaction (+84.39%) and fear control (+85.25%), indicative of substantial psychological growth. Notably, fundamental competencies such as goal setting and commitment also demonstrated significant growth, reaching +68.88% and +34.87%, respectively. Additionally, cognitive abilities such as concentration (+75.44%) and competition readiness (+82.93%) demonstrated notable enhancements (p<.05).

Table 1. Evolution and variation of inclusion, as well as mental skills before and after intervention

| Variables | Experimental protocol | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Control Group | | | p | η2 | APE Group | | | p | η2 | APE+ ParaAthletics Group | | | p | η2 |
| | Before | After | F | | | Before | After | F | | | Before | After | F | | |
| 1.SPIS | 3.09±1.01 | 2.91±0.88 | 8.862 | NS | - | 3.52±0.77 | 4.29±0.59 | 1.098 | .000 | 0.57 | 4.09±0.59 | 4.78±0.49 | 27.866 | .000 | 0.64 |
| 2.SSIS | 2.88±0.60 | 2.85±0.62 | 0.041 | NS | - | 3.45±0.72 | 3.71±1.10 | 3.328 | .000 | 0.14 | 2.97±0.65 | 4.41±0.67 | 59.257 | .000 | 1.10 |
| 3.Goal setting | 2.93±0.77 | 3.03±0.72 | 0.374 | NS | - | 3.18±0.85 | 4.90±0.73 | 75.878 | .000 | 1.09 | 3.92±1.46 | 6.62±0.47 | 103.185 | .000 | 1.40 |
| 4.Commitment | 2.94±0.75 | 3.06±0.80 | 0.946 | NS | - | 3.21±0.84 | 4.82±0.75 | 57.747 | .000 | 1.01 | 4.85±1.69 | 6.49±0.47 | 20.944 | .000 | 0.76 |
| 5.Self-confidence | 2.99±0.70 | 3.08±0.75 | 0.272 | NS | - | 3.12±0.83 | 4.57±0.94 | 46.445 | .000 | 0.82 | 4.76±1.64 | 6.42±0.53 | 25.752 | .000 | 0.77 |
| 6.Stress Reaction | 2.99±0.73 | 3.08±0.74 | 0.708 | NS | - | 3.28±0.93 | 4.45±0.80 | 23.319 | .000 | 0.68 | 3.46±1.02 | 6.38±0.62 | 208.321 | .000 | 1.78 |
| 7.Fear control | 3.06±0.82 | 3.03±0.76 | 0.000 | NS | - | 3.25±0.87 | 4.33±0.81 | 24.49 | .000 | 0.64 | 3.39±0.97 | 6.28±0.80 | 140.776 | .000 | 1.63 |
| 8.Relaxation | 3.07±0.77 | 3.07±0.75 | 0.000 | NS | - | 3.21±0.74 | 4.17±0.70 | 29.17 | .000 | 0.67 | 3.39±0.97 | 6.25±0.84 | 130.612 | .000 | 1.58 |
| 9.Activation | 2.96±0.55 | 3.05±0.66 | 1.365 | NS | - | 3.16±0.65 | 4.30±0.72 | 34.346 | .000 | 0.83 | 3.38±0.91 | 6.09±0.89 | 115.105 | .000 | 1.51 |
| 10.Concentration | 2.97±0.48 | 3.04±0.60 | 0.826 | NS | - | 3.14±0.61 | 4.46±0.64 | 52.448 | .000 | 1.06 | 3.38±1.02 | 5.93±0.94 | 93.646 | .000 | 1.30 |
| 11.Distraction control | 2.77±0.36 | 2.96±0.68 | 2.985 | NS | - | 3.13±0.61 | 4.42±0.70 | 64.38 | .000 | 0.98 | 3.28±1.06 | 5.96±0.91 | 115.511 | .000 | 1.36 |
| 12.Mental Imagery | 2.63±0.34 | 2.93±0.78 | 3.524 | NS | - | 3.24±0.82 | 4.45±0.80 | 28.846 | .000 | 0.75 | 3.28±1.06 | 5.87±1.00 | 103.519 | .000 | 1.26 |
| 13.Mental practice | 2.56±0.27 | 3.07±0.75 | 5.917 | NS | - | 3.25±0.78 | 4.43±0.96 | 20.131 | .000 | 0.68 | 3.35±1.12 | 5.93±1.08 | 76.847 | .000 | 1.17 |
| 14.Planing | 2.57±0.32 | 3.09±0.81 | 11.006 | NS | - | 3.12±0.75 | 4.32±0.92 | 27.303 | .000 | 0.72 | 3.34±1.02 | 6.11±0.88 | 137.213 | .000 | 1.46 |

All results are written as mean±standard deviation, SPIS.Sense of pedagogical inclusion, SSIS.Sense of school inclusion, NS. Not significant, Significance p< .05

## *Measuring the effect of programs on inclusion and on mental skills*

The tables presented offer a comprehensive analysis of the impact of intervention protocols on a range of IPE and mental ability variables. Table 2 illustrates the results of a PostHoc ANOVA analysis examining the influence of interventions on multiple dimensions, including SPIS, SSIS, and various fundamental, psychosomatic, and cognitive skills. The data demonstrate that the interventions have a statistically significant impact (p<.001) on all the dimensions under study, with high F values. Table 3 provides further insight by comparing the impact of separate protocols (control, adapted physical education, and adapted physical education plus para-athletics) on the same variables. The results demonstrate that all pairwise comparisons are statistically significant (p<.001), indicating statistically notable discrepancies between the experimental and control groups.

Table 2. Protocol impact on IPE variables and mental skills before and after intervention

| Variables | SS | Df | Mean Square | F | p |
|---|---|---|---|---|---|
| 1.SPIS | 8.731 | 1 | 8.731 | 17.423 | .000 |
| 2.SSIS | 14.780 | 1 | 14.780 | 22.391 | .000 |
| 3.Goal setting | 170.275 | 2 | 85.137 | 84.834 | .000 |
| 4.Commitment | 235.139 | 2 | 117.569 | 103.016 | .000 |
| 5.Self-confidence | 219.837 | 2 | 109.918 | 95.100 | .000 |
| 6.Stress Reaction | 116.078 | 2 | 58.039 | 83.012 | .000 |
| 7.Fear control | 104.755 | 2 | 52.378 | 71.612 | .000 |
| 8.Relaxation | 101.670 | 2 | 50.835 | 77.592 | .000 |
| 9.Activation | 98.018 | 2 | 49.009 | 91.183 | .000 |

| | | | | | |
|---|---|---|---|---|---|
| 10.Concentration | 88.487 | 2 | 44.244 | 80.819 | .000 |
| 11.Distraction control | 100.953 | 2 | 50.476 | 86.292 | .000 |
| 12.Mental Imagery | 106.416 | 2 | 53.208 | 99.574 | .000 |
| 13.Mental practice | 108.479 | 2 | 54.239 | 94.633 | .000 |
| 14.Planing | 117.068 | 2 | 58.534 | 140.665 | .000 |

SC. Sum of squares Type III, SPIS.Sense of pedagogical inclusion, SSIS.Sense of school inclusion, Significant p < .05, ** Very Significant, * Significant

Table 3. Pairwise comparison of PPE and mental ability variables before and after intervention

| Variables | Protocol | | | | | |
|---|---|---|---|---|---|---|
| | Control Group | | APE Group | | APE + ParaAthletics Group | |
| | APE | APE + Para- Athletics | Control | APE+ Para- Athletics | APE | Control |
| 1.SPIS | .000 | .000 | .000 | .002 | .000 | .002 |
| 2.SSIS | .000 | .000 | .000 | .020 | .000 | .020 |
| 3.Goal setting | .000 | .000 | .000 | .000 | .000 | .000 |
| 4.Commitment | .000 | .000 | .000 | .000 | .000 | .000 |
| 5.Self-confidence | .000 | .000 | .000 | .000 | .000 | .000 |
| 6.Stress Reaction | .000 | .000 | .000 | .000 | .000 | .000 |
| 7.Fear control | .000 | .000 | .000 | .000 | .000 | .000 |
| 8.Relaxation | .000 | .000 | .000 | .000 | .000 | .000 |
| 9.Activation | .000 | .000 | .000 | .000 | .000 | .000 |
| 10.Concentration | .000 | .000 | .000 | .000 | .000 | .000 |
| 11.Distraction control | .000 | .000 | .000 | .000 | .000 | .000 |
| 12.Mental Imagery | .000 | .000 | .000 | .000 | .000 | .000 |
| 13.Mental practice | .000 | .000 | .000 | .000 | .000 | .000 |
| 14.Planing | .000 | .000 | .000 | .000 | .000 | .000 |

SPSI.Sense of pedagogical inclusion, SSIS.Sense of school inclusion, Significant p < .05

## *Exploring the relationship between inclusive physical education (IPE) variables and mental skills*

Table 4 presents a correlation matrix that analyzes the associations between IPE and mental skills variables, both before and after the intervention. Significant correlations (p < .05) demonstrate a robust relationship between the sense of IPE, whether pedagogical and/or school, and several mental skills, including commitment (r = .390), goal setting (r = .279) and self-confidence (r = .366). Furthermore, psychosomatic abilities such as stress management and fear control demonstrated robust correlations with one another (r = .936), as well as with other variables, including relaxation (r = .852) and activation (r = .840). Furthermore, cognitive abilities, particularly concentration and distraction control, demonstrate significant correlations with psychosomatic and fundamental skills. For instance, activation (r =.833) and stress reaction (r =.513) clearly correlate with concentration.

Table 4. Correlation matrix between PPE variables and mental skills before and after intervention

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.SPIS | 1 | | | | | | | | | | | | | |
| 2.SSIS | .603** | 1 | | | | | | | | | | | | |
| 3.Goal setting | 0.043 | .279** | 1 | | | | | | | | | | | |
| 4.Commitment | 0.200 | .366** | .605** | 1 | | | | | | | | | | |
| 5.Self-confidence | .212* | .390** | .475** | .421** | 1 | | | | | | | | | |
| 6.Stress Reaction | -0.079 | .209* | .662** | .443** | .434** | 1 | | | | | | | | |
| 7.Fear control | -0.080 | 0.143 | .580** | .365** | .376** | .936** | 1 | | | | | | | |
| 8.Relaxation | -0.038 | 0.138 | .580** | .328** | .341** | .852** | .921** | 1 | | | | | | |
| 9.Activation | 0.103 | .232* | .508** | .316** | .229* | .633** | .721** | .840** | 1 | | | | | |
| 10.Concentration | 0.122 | 0.196 | .574** | .352** | .339** | .513** | .569** | .666** | .833** | 1 | | | | |
| 11.Distraction control | 0.165 | .207* | .515** | .344** | .364** | .420** | .407** | .477** | .639** | .889** | 1 | | | |
| 12.Mental Imagery | 0.135 | .255* | .525** | .360** | .346** | .458** | .429** | .420** | .551** | .775** | .894** | 1 | | |
| 13.Mental practice | 0.142 | .252* | .564** | .312** | .331** | .497** | .467** | .482** | .524** | .690** | .787** | .913** | 1 | |
| 14.Planing | 0.132 | .289** | .546** | .359** | .354** | .430** | .373** | .411** | .485** | .617** | .732** | .826** | .930** | 1 |

SPIS.Sense of pedagogical inclusion, SSIS.Sense of school inclusion, ** Very Significant (p < .01), * Significant (p < .05)

## Discussion

This study demonstrates the beneficial effects of APE and adapted sport on the development of mental abilities, as well as the pedagogical benefits of inclusive physical education (IPE) and scholarship for

students with motor impairments. The results consistently indicate that interventions combining APE and para-athletics have a significant positive effect on several critical dimensions of student development. The study revealed that improved mental skills, particularly psychosomatic abilities such as stress reaction, anxiety control, and relaxation, were a significant outcome. These findings are consistent with the results of previous research indicating that regular physical activity plays an essential role in stress reaction and anxiety reduction in young people with disabilities. (Yang et al., 2022). The structure of the APE provides an optimal framework for students to acquire and develop psychosomatic skills, thereby offering a beneficial environment for students who may be exposed to higher levels of stress due to their disabilities. (Thelwell & Greenlees, 2001). Furthermore, participants exhibited notable enhancements in cognitive abilities ($p<.05$), including concentration, distraction control, and mental training. These abilities are crucial not only for maximizing athletic performance but also for academic achievement and the capacity to navigate the demands of daily life (El Moutaraji et al., 2021a, 2021b; McLean et al., 2021). The enhancement of these cognitive abilities is attributed to the structured and repetitive nature of para-athletic training, which encourages students to develop effective strategies for maintaining focus and managing distractions (Rán Hafliðadóttir, 2022). The enhancement of these cognitive abilities is attributed to the structured and repetitive nature of para-athletic training, which encourages students to develop effective strategies for maintaining focus and managing distractions (Bulut et al., 2024). Recent research has revealed variations in engagement in PE (Ben Rakaa et al., 2024b). In addition, teachers' perceptions and the sense of pedagogical incompetence have a significant impact on the inclusion of these children in the learning environment (Ben Rakaa et al., 2024c, 2024a).

In contrast, students who participated in the APE and para-athletics programs reported a notable enhancement in their sense of pedagogical and school inclusion more than other groups ($p<.01$). This finding is of particular significance, as the inclusion of students in the school environment is a key factor in their emotional well-being and academic success (Kutsyuruba et al., 2015). Participation in IPA, particularly in the competitive context of para-athletics, can foster a sense of community and strengthen social ties, thereby reducing feelings of isolation, which are often experienced by these athletes (Farmer et al., 2019). The social dynamics inherent in sports and the inclusive nature of sporting activities facilitate constructive social interactions, thus enhancing the inclusion of disabled teenagers in their academic and school communities (Giuriato, 2023). In comparison, an important finding of this study is that programs combining APE and para-athletics were more effective in promoting IPE than APE by itself. This observation can be explained by the competitive and socially engaging dimension of para-athletics, which motivates students to interact more actively with their peers and teachers (Coakley, 2021). When adequately supervised, athletic competition provides an environment conducive to the cultivation of self-confidence and the perception of the value of distinctive abilities, thereby strengthening the sense of belonging to the academic community among participants (Dohle et al., 2022). In the neutral position, the results emphasize the pivotal role of educators in the efficacy of APE and para-athletics programs. It is of the utmost importance that they play an active role in these programs, receive adequate training, and demonstrate commitment to maximize the benefits these programs can offer disabled students (Brown, 2016). Educators who have undergone rigorous training and who are highly attuned to the subtleties of their students' needs are better positioned to cultivate an inclusive learning environment and to develop activities tailored to the specific requirements of students with motor disabilities (Bailey et al., 2009). The quality of educational supervision is a critical determinant of the efficacy of APE teaching interventions (Dagkas & Armour, 2013).

Moreover, the enhanced cognitive abilities and sense of inclusion observed in students engaged in these programs are not exclusive to the athletic domain but rather extend to other domains of their daily lives. The aforementioned skills, such as stress management, concentration, and self-confidence, can be applied to a multitude of situations, including academic pursuits and social interactions outside the academic environment (Chernyshenko et al., 2018). The transferability of skills is of particular benefit to students with motor disabilities, who may encounter additional challenges due to their condition (Blank et al., 2012). Research has demonstrated that this study improves mental skills and fosters inclusion among disabled students, but the literature presents contradictory evidence to support these findings. Research on Chilean physical educators reveals that while attitudes toward teaching students with Down syndrome are generally positive, about one-third reported negative or neutral experiences (Castelli Correia de Campos et al., 2024). The finding suggests that practical barriers may limit the school

(SSIS) and inclusion (SPIS) gains. Similarly, Portuguese PE teachers often lack sufficient training for inclusive practices post-initial education, with minimal interaction with students with special needs (Celestino et al., 2023). This unpreparedness contrasts with the significant mental skill improvements—like commitment (+50.16%) and fear control (+85.25%)—noted in APE and para-athletics groups, raising doubts about replicability in less-prepared contexts. Additionally, kinesiology programs fail to adequately equip educators for inclusive settings (McNamara et al., 2024), potentially weakening the psychosomatic benefits, such as concentration (+75.44%).

Urban students in the Paralympic School Day program still faced negative attitudes toward disabilities, even after taking part, which goes against the improvements in social inclusion and self-confidence they experienced, showing that being physically included doesn't always lead to mental benefits. These findings highlight a gap between experimental outcomes and real-world challenges (Haegele et al., 2021). Beyond teacher readiness, subjective experiences and intervention consistency reveal further discrepancies. Adults with visual impairments recalled exclusion in integrated PE settings (Haegele et al., 2021), challenging the study's reported enhancements in distraction control (+41.21%) and mental imagery (+2.59). These findings suggest that social barriers may undermine cognitive gains in less controlled Similarly, a peer tutoring program helped students with mild special needs participate socially for a short time (Montanero et al., 2024), but its impact was much less effective than the strong increases seen in structured programs (+0.91), suggesting that the social benefits might not last in less organized environments or structured settings. External disruptions make results harder to achieve; for example, when an adapted activity camp was canceled during COVID-19, it caused frustration and less benefit, which goes against the improvements seen in stress reactions. Parents' perspectives also influence the effectiveness of inclusion, as their dissatisfaction with physical integration leads to a decrease in goal-setting progress. These contradictions underscore significant correlations (e.g., stress reaction and fear control, r = .936) may not generalize where inclusion is superficial or disrupted (Block et al., 2021).

## Conclusions

In conclusion, the results indicate that the integration of APA and participation in inclusive school sports have a significant impact on the development of mental skills and the feeling of IPE in individuals with motor impairments. The results demonstrate a significant enhancement in the assessed variables in the groups that participated in an APA program in comparison to the control group. Moreover, these interventions reinforced the sense of inclusion, both pedagogically and academically, thereby facilitating a more harmonious inclusion of students in the school environment. These findings reinforce the necessity of implementing inclusive adapted physical education programs to promote not only physical development but also mental and social well-being in students. The recommendations resulting from this study can assist educators and policymakers in enhancing inclusive education strategies, thereby ensuring that all students, regardless of their abilities, can achieve their full potential within the educational system.

While our study yielded promising findings regarding the influence of APE and para-athletics on cognitive abilities and school inclusion, it is not without its constraints. Notably, the sample was primarily comprised of students below the age of 18, which may restrict the applicability of the findings to younger age groups. Furthermore, although the three-month intervention period was sufficient to observe initial changes, it did not allow for the assessment of long-term effects. A more extended investigation would be required to ascertain the longevity of the observed benefits. The results provide a foundation for future research into the long-term impact of APA and para-athletics interventions. It would be beneficial to examine how these programs influence not only academic performance but also other aspects of student well-being, such as school engagement, satisfaction with school, and active participation in lessons. Furthermore, a comparative study between different educational contexts could provide valuable insight into the optimal conditions for implementing these programs.

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