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The Evaluation and Fidelity of an Interdisciplinary Educational Programme

José Francisco Jiménez-Parra, David Manzano-Sánchez * and Alfonso Valero-Valenzuela

Department of Physical Activity and Sport, Faculty of Sport Sciences, University of Murcia, 30720 Murcia, Spain
* Correspondence: david.manzano@um.es

Abstract: The aims of the present study were to evaluate the fidelity of the implementation of an interdisciplinary educational programme and to examine the differences between the teaching strategies and interpersonal teaching style used by teachers who apply an interdisciplinary educational programme and those teachers who use a conventional methodology. This is a quasi-experimental repeated measures research with a non-randomised Experimental Group (EG) and Control Group (CG). A total of 4 teachers, aged 27–52 years (M = 38.5), and 104 6th grade primary school students, aged 11–13 years (M = 11.59; SD = 0.60), participated. The intervention programme lasted 16 weeks in which the EG implemented a teaching methodology based on the incorporation of active breaks (AB) into the structure of the Teaching Personal and Social Responsibility (TPSR) model, while the CG used a conventional methodology. The results show that the teachers who adhered to the educational programme significantly improved the implementation of strategies related to the TPSR + AB throughout the intervention, particularly when compared with the CG. In addition, the strategies used by the EG had a positive impact on the improvement of the students' educational values and physical activity during the classes, as well as their perception of the transfer of autonomy. In conclusion, the present study evidences the compatibility and feasibility of combining the TPSR and AB in any educational matrix to improve teachers' teaching strategies, students' behavioural and motor responses, as well as the autonomy support style.

Keywords: active breaks; teaching personal and social responsibility; physical education; active methodologies; elementary education; educational values; physical activity; interpersonal teaching style

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1. Introduction

In the last two decades, there has been an exponential increase in the number of intervention programmes in schools whose main objective is to develop children and adolescents in a comprehensive and multi-competential way so that they have sufficient tools to adapt to society and become responsible citizens [1] with an active and healthy lifestyle [2].

1.1. Teaching Personal and Social Responsibility (TPSR)

From a psychosocial perspective, the development of social-emotional competences, known as "life skills" [3], is necessary through positive youth development programmes or social and emotional learning programmes [4–6] based on active methodologies such as the Personal and Social Responsibility Model (TPSR) [7]. TPSR is a pedagogical model that has demonstrated its ability to achieve these goals and foster educational values [8,9]. Its application in different contexts and settings evidences the practical appeal of TPSR beyond the field of Physical Education, providing an effective framework for developing life skills and social and emotional learning through different areas of the school curriculum [3,8,10].

One of the main characteristics of this pedagogical model is that it presents some fundamental elements, such as the levels of responsibility [7], which can be worked on progressively, cumulatively or interactively [11] to teach participants responsible behaviour and attitudes. These levels, following Hellison, are [7]: (1) respect for the rights of others,

(2) participation and effort, (3) autonomy, (4) leadership and helping others, and (5) transfer outside the classroom. Another element is the structure of the sessions, which can be modified by each teacher to adapt the model to their classroom or subject context: (a) relation time, (b) awareness talk, (c) physical activity plan, (d) group meeting and (e) self-reflection time.

There are also other key elements such as teaching strategies to foster personal and social responsibility, including: modeling respectful behaviour, setting expectations, encouraging social interactions, involving students in decision-making, assigning management tasks, giving voice and vote, sharing responsibilities autonomously, evaluating classroom behaviour and performance, and discussing the transfer of values and content to other settings [12].

The main elements of the model and the teaching strategies used by teachers who apply the TPSR in the classroom seem to have a positive impact on the autonomy support perceived by students, showing a close relationship and interaction between the model and the interpersonal teaching style [13]. In this sense, the figure of the teacher in the classroom is fundamental in generating behavioural responses or positive perceptions on the part of students, such as increased motivation, participation and satisfaction of basic psychological needs [13].

Following the proposal of Moreno-Murcia et al. [14], the interpersonal style is divided into two aspects: (a) *autonomy support style*, characterised by taking into account the students' thoughts and feelings, giving them autonomy in the selection of activities and motivating them through the use of internal motivational resources; and (b) *controlling style*, characterised by the authority adopted by the teacher who conditions the students' feelings, thoughts and actions, through the use of external incentives. Different studies corroborate the efficacy of adopting teaching styles based on autonomy with respect to others that are more controlling [13,15,16], since the support of autonomy generates very positive consequences in students and teachers at the emotional, cognitive and behavioural levels [17].

1.2. Classroom-Based Physical Activity

From a health perspective, motor development and the promotion of an active lifestyle are required to avoid the risk of motor, metabolic and cardiovascular disorders in children and adolescents [18]. In this regard, the World Health Organization [19] recommends that children and adolescents aged 5–17 years accumulate a minimum of 60 min of daily moderate to vigorous intensity physical activity (MVPA), as well as activities that strengthen muscles and bones three days a week. The scientific community has implemented numerous physical activity programmes to achieve these recommendations; however, there is still a large percentage of the world's population in this age range that does not meet the established minimums [20,21].

According to Masini et al. [18], it seems that schools are the ideal setting and time to carry out these programmes, as young people spend many hours in this environment and it is accessible to all types of people, regardless of their age, ethnicity, gender or socio-economic status. In education, many school-based programmes have been implemented to promote physical activity among students, such as those based on active transport or active breaks. However, classroom-based physical activity programmes or active breaks (AB) are the ones that have reported the most benefits in terms of physical activity level, reaching 50% of WHO recommendations [22], as well as in other variables such as physical fitness, executive functions, academic performance and classroom behaviour of young people [18,23–25].

These AB are understood as physical activity breaks of short duration (between 5 and 15 min) at any level of intensity, predominantly MVPA, which are guided by teachers within the classroom during the normal course of the session [25,26]

1.3. Fidelity in Implementing Educational Programmes

The research community has begun to realise the critical importance of fidelity of implementation (FOI) in intervention research [27], as this factor can mediate between an intervention programme and the outcomes achieved [3]. In this way, FOI is understood as the degree to which the delivery of a programme shows the researchers' initial intentions and plans [3]. According to its conceptual framework [3,27], FOI evaluation can be conducted based on five key elements or components: (a) programme adherence, (b) programme duration, (c) quality of programme delivery, (d) receptivity or responsiveness of participants to the programme and (e) programme differentiation. Using any of these terms individually or in combination may be appropriate indicators to measure FOI [3].

Within sport pedagogy and model-based practice of Physical Education [28], the importance of providing a critical account that addresses the description of the curricular elements and context of the programme, as well as a validation of the application of the model or methodology, is highlighted [29]. However, this essential aspect remains a challenge for many of the intervention studies based on sport pedagogy [3,27]. In this sense, the systematic reviews conducted on TPSR [8,9,30] and classroom-based physical activity [18,31] agree that the main weakness and research gap of these methodologies, when applied independently, is the follow-up and fidelity of the implementation of the programme.

Research on the FOI of TPSR-based programmes is still scarce [8,9,30] although the results of existing studies reveal teachers' compliance with the essential components of TPSR in programme implementation [8] and their relationship with student response [3]. Martinek and Hellison (2016) noted that focusing on personal strengths, available resources and improving interpersonal processes between students and instructors is essential to increase the prospects for successful implementation of a TPSR programme. The Tool for Assessing Responsibility-Based Education (TARE) was designed and validated by Wright and Craig [12] to assess the FOI of programmes based on the TPSR model and to analyse the relationship between teaching strategies and student response. Therefore, the TARE is an ideal tool to measure the five fundamental elements of FOI mentioned above, as well as to examine students' responsible behaviours [3].

The FOI of AB-based programmes is also very low, as can be seen in the systematic review by Watson et al. [25], where only 12 studies out of 39 reported using different measures such as physical activity intensity or teacher reports. Furthermore, these same authors indicated that none of these 12 studies clearly reported on compliance with the implementation of daily active breaks or the number of AB sessions performed. The Watson et al. [31] study conducted an FOI process in which teachers recorded a log of the date and time they completed AB, while students wore accelerometers to calculate physical activity intensity in 15 s intervals. In this way, they were able to compare the accelerometer data with the teachers' records to assess the intensity of physical activity during each AB [31]. Muñoz-Parreño et al. [32] videotaped the classes to carry out an observational analysis and check that the programme was being applied correctly, thus ensuring the effectiveness of the procedure. This analysis was carried out by means of an ad-hoc checklist comprising fundamental characteristics of the AB such as: class interruption, movement within the classroom, integration of academic content, work on emotional intelligence or emotional content, promotion of social interaction and cooperative learning. This instrument was adapted and used in the study by Jiménez-Parra et al. [33] with good results in terms of fidelity throughout the intervention.

1.4. Applying the TPSR and AB in the Classroom

Numerous research studies establish that the educational community could benefit from the application of TPSR [3] and AB [26] in the classroom to promote social-emotional learning and active lifestyles in students [4,5,18,22]. In the Spanish educational context, there is a great opportunity to implement multidisciplinary programmes that contemplate both methodologies [34] as the new education law in force integrates personal and social responsibility competences in the school curriculum, as well as the promotion of sport

and healthy habits [35]. Similarly, the Ministry of Health suggests promoting physical activity in the classroom to combat sedentary lifestyles and childhood obesity through AB programmes such as the DAME10 programme [36].

Based on the above, the authors designed an AB educational programme integrated into the structure of the TPSR model so that it could be applied in multiple areas and stages of the Spanish educational context. The main reasons that justify this proposal are: (a) both TPSR and AB have a strong theoretical basis and scientific support, (b) they are two methodological approaches with a cross-cutting and interdisciplinary nature that can be applied to all types of students and in different subjects and curricular content, (c) they have essential characteristics and elements that are compatible with each other, and (d) the intervention programmes based on both methodologies follow a detailed FOI process.

Therefore, the general purpose of the present study was to evaluate the fidelity of the implementation of a multidisciplinary educational programme in the school context to address the research gaps found in the implementation of TPSR and AB. The specific objectives of this study were: (a) to assess the feasibility of implementing an educational programme based on the combination of TPSR and AB in the school curriculum; (b) to evaluate the teaching strategies used by teachers in the classroom and to check whether they are associated with behavioural responses of their students, (c) to compare the pedagogical strategies between those teachers who apply an interdisciplinary educational programme and those who use a conventional methodology and (d) to find out the students' perception of their teachers' interpersonal style.

2. Materials and Methods

2.1. Participants

The recruitment of teachers and students was carried out using a convenience and accessibility sampling technique. The principal investigator (J.F.J.-P.) gave a 30 min talk in two primary schools which participated in the research, on the objectives of the study and the rationale for the implementation of the programme in the school. The teachers were then invited to participate in a professional development course on active teaching methodology and the implementation of the programme over 4 months (16 weeks). The study involved four teachers divided into EG (n = 2) and CG (n = 2), aged between 27 and 52 years (M = 38.5) and with teaching experience between 4 and 25 years (M = 12.75). Inclusion criteria for participation in the study were: (a) attendance at all initial training sessions; (b) completion of a minimum amount of continuing professional development; (c) commitment to implement the intervention programme in at least 80% of the weekly classes for 4 months; and (d) allowing video recording of the sessions. This last criterion was the only one considered for the inclusion of teachers in the CG, together with the application of a conventional teaching methodology. The four participants were 6th grade primary school teacher-tutors, who taught Mathematics, Spanish Language, Social Sciences and Natural Sciences in two schools located in two municipalities in the Region of Murcia with a medium-low socio-economic level.

A total of 104 students (Figure 1), participated in this study and were distributed in four 6th grade classes, aged between 11 and 13 years (M = 11.59; SD = 0.60). Informed consent was obtained from teachers and the students' legal guardians prior to data collection. The consent included permission to videotape the lessons, guaranteeing that the data would be used exclusively for training and research evaluation purposes. The management team and the teaching staff of both schools approved the study, while the Ethics Committee of the University of Murcia approved the present research (3207/2021), which was carried out in accordance with the guidelines of the Declaration of Helsinki.

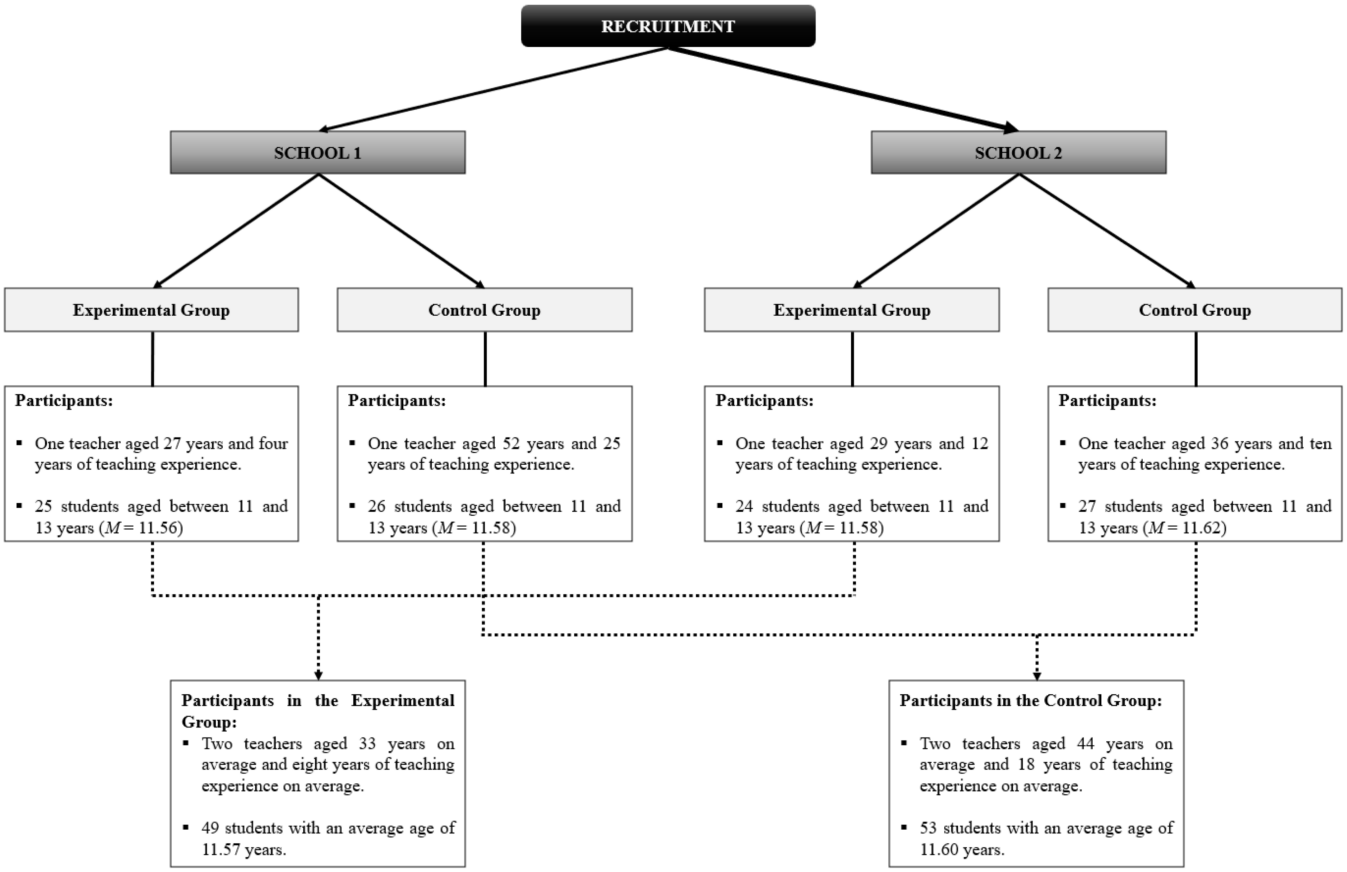

Figure 1. Recruitment of participants and distribution of the sample.

2.2. Instruments

(1) Tool for assessing responsibility-based education and physical activity in the classroom (TARE–AB): the three subscales of the Spanish version of the tool for assessing responsibility-based education (TARE) [12,37] validated by Escartí et al. [38] and which was combined with the items of the instrument for assessing active breaks (IEDA) [39]. Both instruments had been tested in the field of education in primary schools [1,32,40]. The subscales used are explained in more detail below.

- Subscale 1: responsibility and physical activity teaching strategies in the classroom. This section of the TARE represents teaching strategies or teacher behaviour that foster personal and social responsibility. The analysis requires observers to use an interval recording system indicating the presence or absence of such strategies during five-minute periods [12]. To incorporate strategies that encourage physical activity in the classroom, three items from the IEDA [39] were included in this subscale (Table 1). The internal consistency was Omega = 0.960.

Table 1. Subscale 1 of the *TARE–AB* instrument.

Teaching Strategies of the ACTIVE VALUES Programme	
TPSR Teaching Strategies	**Description**
Example of respect (R)	The teacher is an example of respect. He/she communicates respectfully both with individual students and with the whole group.

Table 1. *Cont.*

Teaching Strategies of the ACTIVE VALUES Programme	
TPSR Teaching Strategies	**Description**
Setting expectations (E)	The teacher makes explicit to learners what is expected of them. For example, how to conduct practical lessons, rules, procedures and manners.
Providing opportunities for success (S)	The sessions are structured by the teacher so that all learners have the opportunity to participate in the activities successfully, regardless of individual differences.
Promotion of social interaction (SI)	The teacher structures activities that encourage positive social interaction. This could involve pupil–pupil interaction through cooperation, teamwork, problem solving, conflict resolution.
Task assignment (T)	The teacher assigns specific responsibilities or tasks to learners (other than leadership) that facilitate the organisation of the programme or a specific activity. For example, being responsible for organising the library, fetching chalk, etc.
Leadership (L)	The teacher allows pupils to lead or be in charge of a group. For example, being a member of the responsibility court or teaching a task to the rest of the classmates.
Granting choice and voice (V)	The teacher provides opportunities for students to make choices and gives them a voice, for example in group discussions, group voting, individual choices, asking questions, sharing opinions and evaluating the programme or the teacher.
Role in the assessment (A)	The teacher allows learners to have a role in the assessment of learning (self- and co-assessment).
Transfer (Tr)	The teacher talks to the learners about the possibility of transferring (applying) the life skills or responsibilities worked on in the session to other contexts outside the programme.
AB Teaching Strategies	**Description**
Movement (MOV)	The teacher encourages children to move for 5–10 min in a structured and planned way, performing exercises such as squats, push-ups, jumping jacks, etc.
Structure (EST)	The activities used by the teacher (active breaks) show a well-defined structure: introduction, development of the movement and return to the basic levels.
Animation/Participation (PAR)	The teacher encourages or actively intervenes in the activities planned to pro-motivate student movement.

Note: TPSR = Teaching Personal and Social Responsibility; AB = Active Breaks.

- Subscale 2: themes of the ACTIVE VALUES programme. The second subscale (Table 2) is completed by observers once the last five minute interval of a given session has been coded. These observers should provide a holistic assessment of the extent to which teachers have promoted responsibility and physical activity throughout a lesson. Assessment and grading are carried out on the basis of the four themes that characterise the teaching of personal and social responsibility [7,12]. To these four themes, a theme characterising physical activity-based teaching was added [25]. Thus, subscale 2 consisted of five items. The items were rated using a five-point Likert-type scale ranging from 0 (never) to 4 (very much), with an internal consistency value of Omega = 0.956. The score sheet for this subscale can be found in Table 2, together with a description of its component items.

Table 2. Subscale 2 of the *TARE–AB* instrument.

Teachers' Behaviour	4 Extensively	3 Frequently	2 Occasionally	1 Rarely	0 Never	Observations
Integration (TPSR): the extent to which teachers integrate the roles and concepts of responsibility in the session.	4	3	2	1	0	
Transfer (TPSR): the extent to which teachers connect the application of life skills to other environments and contexts.	4	3	2	1	0	
Empowerment (TPSR): the extent to which teachers share responsibility with students.	4	3	2	1	0	
Teacher–student relationship (TPSR): the extent to which teachers treat students as individuals who deserve respect, choice and voice.	4	3	2	1	0	
Physical activity (AB): the extent to which teachers incorporate physical activity breaks related to academic content and life skills.	4	3	2	1	0	

Note: TPSR = Teaching Personal and Social Responsibility; AB = Active Breaks; 0—Never = none of the teacher's actions or words clearly fit this theme throughout the session; 1—Rarely = this theme may be reflected in some specific words or actions of the teacher at isolated moments; 2—Occasionally = some of the teacher's words and actions relate to this theme during the lesson, either directly or indirectly; 3—Frequently = the subject is addressed directly at various points in the session through the words or actions of the teacher; 4—Extensively = the theme is evidenced in multiple ways during the session and is directly addressed through the teacher's words and actions.

- Subscale 3: behavioural responses of students. In this subscale, observers assess the degree to which students actively participate and show personal and socially responsible behaviour during the sessions. The ratings are made after the last five minute interval of a lesson has been viewed, following a five-point Likert-type scale ranging from 0 (very weak) to 4 (very strong). The TARE categories correspond to easily observable behaviour from the first four levels of responsibility of the TPSR [3]. As in subscales 1 and 2, an item was included to assess students' behaviour during AB. Thus, subscale 3 was composed of six items, which are described in Table 3. The internal consistency was Omega = 0.964.

Table 3. Subscale 3 of the *TARE–AB* instrument.

Students' Behaviour	4 Very Strong	3 Strong	2 Moderate	1 Weak	0 Very Weak	Observations
Respect (L1): the student does not verbally or physically harm other students, works well and resolves conflicts peacefully if they arise.	4	3	2	1	0	
Participation (L2): the learner is involved in all activities, taking on roles or functions if asked to do so.	4	3	2	1	0	
Effort (L2): the learner strives and attempts all tasks to improve and progress.	4	3	2	1	0	
Self-direction (L3): the learner stays in the activity without direct supervision, working individually or in groups, and is able to resist peer or group influence.	4	3	2	1	0	
Caring (L4): the learner offers help, encouragement and positive feedback to others.	4	3	2	1	0	

Table 3. *Cont.*

Students' Behaviour	4 Very Strong	3 Strong	2 Moderate	1 Weak	0 Very Weak	Observations
Movement (AB): the student leaves his or her desk (sedentary position) and moves actively during the period of physical activity in the classroom (5–10 min).	4	3	2	1	0	

Note: L = level of TPSR; AB = Active Breaks; 0—Very Weak = very few if any students displayed this behaviour, while most struggled to do so, with the exceptions being frequent and/or severe enough to render some parts of the session ineffective; 1—Weak = some students exhibited this behaviour, but not many, the exceptions being frequent and/or severe enough to impede learning; 2—Moderate = a large proportion of the pupils showed this behaviour, but there are still some who did not, with several exceptions noted; 3—Strong = the majority of students showed responsible behaviour and physical activity throughout the session with minor and/or isolated exceptions; 4—Very Strong = all students showed this behavioural attitude throughout the session, with no observed exceptions.

(2) *Autonomy Support Scale:* To assess the autonomy support perceived by students from their teachers, the Autonomy Support Scale in Physical Education (EAA–EF), designed and validated in the Spanish context by Moreno-Murcia et al. [14] was used and adapted to the general context. The instrument was adapted by slightly modifying the wording of the previous sentence, as the items are perfectly adapted to general education. The scale consisted of 11 items (e.g., "values our ideas and suggestions and lets us propose things") which were preceded by a pre-sentence: "In my classes, my teacher...". Responses were recorded on a Likert-type scale ranging from 1 (definitely no) to 5 (definitely yes). The internal consistency analysis yielded the values of Omega = 0.761 in the pre-test and 0.938 in the post-test.

(3) *Controlling style:* In order to find out about the controlling style that students perceive their teachers to have, the Controlling Style in Physical Education Scale, designed and validated in the Spanish context by Moreno-Murcia et al. [14], was used and adapted to the general context. This scale, like the EAA–EF, was adapted through a slight modification in the wording of the sentence prior to the items, which are adequately adapted to general education. The scale consisted of nine items (e.g., "Talks continuously and does not allow us to make contributions in class") which were preceded by a pre-sentence: "In my classes, my teacher...". This instrument also recorded responses on a Likert-type scale with options ranging from 1 (definitely no) to 5 (definitely yes). The internal consistency analysis yielded the values of Omega = 0.854 in the pre-test and 0.900 in the post-test.

Both scales were completed by the students before and after the intervention (pre- and post-tests) in a quiet environment in the classroom corresponding to each group-class. The completion time was 10–15 min. Before starting data collection, the principal investigator explained to the students how to fill in the scales and read the items to ensure students' understanding. After that, the participants were encouraged to answer honestly and sincerely. During the completion time, the researcher was present to answer any questions.

2.3. Procedure

2.3.1. Study Design

This is a quasi-experimental research design, with a non-randomised Control Group (CG) and Experimental Group (EG). The study presents a mixed methods approach to data triangulation, as the observational analysis during the implementation of the programme is complemented by the analysis of the questionnaires.

2.3.2. Intervention Programme

The intervention programme lasted 16 weeks, in which the contents of the subjects of Mathematics, Spanish Language, Social Sciences and Natural Sciences, established in the Spanish law on education [35] were developed to reinforce the relevance of the study [3].

Teachers taught sessions with a duration of 60 to 90 min, computing a total of 20 h per week with each class. The only difference between EG and CG was the mode of teaching:

CG: Teachers were placed at the centre of the teaching–learning process and decision-making, whose only priority was focused on developing the conceptual and scientific aspects of each subject without the possibility for students to actively participate in learning [41]. Therefore, the methodology used considered the student as a receiver of information, whose role was passive, and with critical and metacognitive thinking as secondary [1].

EG: Teachers implemented an educational programme, called ACTIVE VALUES, based on the incorporation of the AB into the structure of the TPSR, whose intervention protocol has been previously published [39]. This programme approached the TPSR in a flexible manner so that teachers could modify and adapt it to both teaching and the needs of their students, as suggested by different research [3,7,11]. The levels of responsibility, a key element of the programme, were developed in an interactive, progressive and cumulative way (one per month) through the establishment of learning objectives and relevant behaviour [3], defined in achievement indicators to facilitate understanding. Level V (transfer) was worked on in connection with the rest of the levels throughout the programme to enhance its relevance and presence in everyday school life.

Teachers were asked to follow a daily and consistent structure to implement the programme, based on the session format proposed by Hellison [7] and adapted to all subjects by Escartí et al. [3] and Manzano-Sánchez & Valero-Valenzuela [1] Teachers began the session by discussing the personal and social responsibility behaviour to be addressed that day by setting expectations (Phase 1. Awareness-raising). The goals were related to the children, displayed in the classroom by means of posters, together with the physical activity to be carried out in the classroom. Teachers followed a pedagogical approach to learning activities during the central part of the session (Phase 2. Active responsibility), based on the application of strategies related to TARE–AB. In this phase, AB were carried out following the methods proposed by Sánchez-López et al. [26] and Watson et al. [31] and implemented in other research studies [33,34,39]. The AB were developed and related to the target level of responsibility of the session. Physical activity in the classroom took place 20–30 min into the session, when teachers detected a decrease in students' attention or when students requested it by mutual agreement with the teacher. In the final stretch, teachers led group meetings (Phase 3. Group meeting), through open questions for 5–10 min (e.g., What did you learn? How did you learn?), with students sharing opinions, feelings or ideas about the programme at a general level or about the daily experience at a particular level [3]. Finally, teachers concluded the session by encouraging reflection and feedback on general or specific aspects of the class (e.g., engagement in an AB or activity) through self and co-evaluation (Phase 4. Self and co-evaluation) using the thumb technique (e.g., Do you think that your classmates have met the objectives set for this session?).

In addition, it was suggested that teachers make extensive use of the themes proposed by Wright & Craig [12] to achieve greater effectiveness in the implementation of the programme, especially with the further development and treatment of transfer of responsibility and physical activity in the out-of-school context (e.g., in what other context could you apply what you have learned? At what time or place could you do the physical activity that has been proposed today?). These themes are: (a) strong respectful teacher-student relationship; (b) integration of responsibility in physical activity; (c) empowering students with responsibility and autonomy; and (d) transfer and extrapolation of values and physical activity in other settings.

2.3.3. Specific Professional Development and Fidelity of Implementation

A teacher training programme was designed and developed, following the recommendations of Lee & Choi [42] to ensure the validity and fidelity of implementing a teaching methodology or programme. Based on the proposal of [3], the training was carried out prior to the intervention (initial training) by means of an intensive 20 h course for the teachers participating in the EG in which different instructional strategies were used, such

as lectures, exemplifications, autonomous work and practical assumptions. The contents addressed in the course were: (a) justification and theoretical foundation of the programme, (b) essential elements of TPSR and AB, (c) considerations for combining both methodologies, (d) description of teaching strategies to promote physical activity in the classroom and to teach personal and social responsibility to students, using TARE–AB, (e) resolution of practical cases, design of sessions and integration of the ACTIVE VALUES methodology into the curriculum, and (f) implementation of strategies for teaching responsibility. In addition, a TPSR manual adapted to the general educational context [43] and the Spanish version [4] of TARE [12] were shared with teachers.

With the intention of maintaining a follow-up during implementation, *Continuous Professional Development* (CPD) [44] was provided in the form of seminars and meetings with teachers every 3–4 weeks to discuss the development of the implementation, identify difficulties or weaknesses of the programme, resolve queries or doubts, and guide and share the application of strategies [45].

In this sense, Pozo et al. [8] indicate that educational interventions require expert control and evaluation of the methodology, as well as continuous and close monitoring of longitudinal studies. Hastie and Casey [29] state that the research team should provide three key elements for the teachers in the research: (a) a detailed description of the curricular elements of the educational programme, (b) validation of the methodology or strategy to be implemented in the study, and (c) a description of the context in which the programme will be developed.

In order to achieve a high degree of fidelity in the implementation of the programme, the TARE–AB instrument, described above, was used, which allowed the evaluation of the teaching strategies related to the combination of the AB and the TPSR. Pre-intervention sessions were recorded with a SONY HDR video camera to reduce reactance bias and two sessions were recorded every three to four weeks to check the degree of fidelity with the programme and to give feedback by writing evaluation reports on those strategies that could be improved. Feedback was shared with teachers in ongoing monitoring meetings during implementation.

Following the same procedure, CG sessions were recorded in order to make sure that a methodology similar to that of the ACTIVE VALUES programme was not being used. In this way, it was possible to analyse and verify the differences between the strategies used by the teachers of the EG and those of the CG.

To assess the validity of the intervention, observational criteria were determined, such as the non-consideration of periods of unobservability, known as those sections in which there is a break in the continuity of the observation session [46] and, in turn, no more than 10% of the total time of the session [47]. A total of 12 sessions recorded by each teacher were considered valid (48 sessions in total), which were collected in: (a) weeks prior (pre-test) to the start of the intervention (2 sessions), (b) between the first and third week (2 sessions), (c) between the fourth and sixth (2 sessions), (d) between the seventh and ninth (2 sessions), (e) between the tenth and twelfth (2 sessions), and (f) between the thirteenth and sixteenth weeks (2 sessions).

The observational analysis was carried out by two graduates in Physical Activity and Sport Sciences and active collaborators of the research group. Following the indications of Wright & Craig [12], specific training was carried out by expert researchers in the AB and the TPSR. The training began with a two-hour session in which the TARE–AB categories were explained and clarified. The observers then analysed two sessions (independently) together with the experts, to carry out a real observational analysis training and to resolve possible doubts. Subsequently, the observers shared the results obtained after the analysis in order to unify criteria and define the degrees of overlap for each of the instrument's categories, as a form of consensual reliability [48]. Finally, observers analysed a third session to calculate inter-observer reliability using the formula proposed by García-López et al. [49]: TA = TA/A + D (total agreement = TA; total agreement = TA; agreement = A; disagreement = D). After a given period (seven days), the same video was analysed by each

observer to obtain intra-observer reliability. After obtaining more than 80% agreement, the analysis of the sessions included in the present study was started.

2.4. Data Analysis

The analysis of the data was carried out with IBM SPSS 22.0 (Armonk, NY, USA) and Jamovi 2.2.5. A preliminary analysis was performed to assess the internal consistency and reliability of the three TARE–AB subscales, autonomous support and controlled interpersonal teaching styles. Based on 48 cases, McDonald's omega on the three subscales and two questionnaires ranged from 0.761 and 0.960, considered appropriate by authors such as Sturrmey, Newton, Cowley, Bouras and Holt [50]. Furthermore, Ventura-León and Caycho-Rodríguez [51] suggest the omega coefficient has a more feasible value for social science studies. Due to its non-continuous variables, it is not affected by the sample error or the number of items. The normality hypothesis was tested using the Kolmogorov–Smirnov test ($p > 0.05$), before using the Mann–Whitney U test to compare the variables between the control and experimental groups. This comparison was carried out both pre- and post-test. The Wilcoxon signed-rank test was used to compare pre and post-test variables.

3. Results

The normality test carried out on Kolmogorov–Smirnov rejected the normality hypothesis for all the variables. Pre- and post-test means and standard deviations of all the variables differentiated by group are shown in Table 4, which also includes the *p*-values obtained with the different nonparametric comparative tests.

A comparison of the pre-test variables of the two groups (control and experimental) with the Mann–Whitney U test did not reveal significant differences. This suggests that the groups were fairly homogeneous with regard to the observed variables prior to beginning the ACTIVE VALUES program.

In the EG, the bulk of the variables improved throughout the process in terms of median values for each one of the subscales, except for assigning management tasks ($p = 0.122$) in the responsibility and physical activity strategies subscale, and decreased significantly with the controlled style ($p < 0.001$). In the CG, the only variable that improved was fostering social interaction ($p = 0.025$) in the responsibility and physical activity strategies subscale and controlled style ($p = 0.034$), while the autonomy support style decreased significantly ($p = 0.035$) after Wilcoxon signed-rank test.

Regarding the differences between groups in the post-test, the Mann–Whitney U test revealed that there were statistically significant differences for the responsibility and physical activity strategies subscale in setting expectations ($p = 0.019$), fostering social interaction ($p = 0.011$), leadership ($p = 0.025$), giving choices and voices ($p = 0.013$), role in assessment ($p = 0.017$), transfer, movement, structure and participation ($p = 0.011$), with variables in favour of the EG. In the general teacher, behaviour subscale (integration, transfer, empowerment, teacher–student relationship and physical activity variables) and in the student behaviour subscale (respect, participation, effort, self-direction, caring and movement variables), there were significant differences in favour of the EG in all variables. With regard to interpersonal style, there were also significant differences in favour of the EG in the autonomy support style, while the CG showed higher values in controlled style variable ($p < 0.001$).

Table 4. Pre-and post-test differences in the subscales according to the group.

		Pre-Test					Post-Test					Pre-Post Test Differences	
		Control		Experimental			Control		Experimental			Control	Experimental
	Variables	Mean	SD	Mean	SD	Mann–Whitney *p*-Value	Mean	SD	Mean	SD	Mann–Whitney *p*-Value	Wilcoxon *p*-Value	Wilcoxon *p*-Value
Subscale 1—TARE-AB	Modelling respect	92.50	5.00	92.50	5.00	1.000	97.50	5.00	100.00	0.00	0.317	0.186	0.040 *
	Setting expectations	47.50	17.08	33.75	4.79	0.180	57.50	12.58	85.00	5.77	0.019 *	0.378	0.019 *
	Opportunities for success	40.00	14.14	26,25	4.79	0.065	52.50	17.08	77.50	15.00	0.078	0.297	0.019 *
	Fostering social interaction	37.50	12.58	36.25	4.79	0.538	57.50	5.00	90.00	0.00	0.011 *	0.025 *	0.013 *
	Assigning management tasks	47.50	15.00	40.00	18.26	0.554	65.00	17.32	57.50	5.00	0.234	0.155	0.122
	Leadership	7.50	9.57	5.00	5.77	0.752	15.00	10.00	40.00	8.16	0.025 *	0.278	0.019 *
	Giving choices and voices	37.50	12.58	38.75	6.29	1.000	47.50	32.02	90.00	0.00	0.013 *	0.243	0.013 *
	Role in assessment	5.00	10.00	5.00	4.08	0.439	10,00	8.16	37.50	5.00	0.017 *	0.350	0.017 *
	Transfer	0.00	0.00	0.00	0.00	1.000	2.50	5.00	30.00	0.00	0.011 *	0.317	0.008 **
	Movement	0.00	0.00	0.00	0.00	1.000	0.00	0.00	27.50	5.00	0.011 *	1.000	0.011 *
	Structure	0.00	0.00	0.00	0.00	1.000	0.00	0.00	27.50	5.00	0.011 *	1.000	0.011 *
	Participation	0.00	0.00	0.00	0.00	1.000	0.00	0.00	27.50	5.00	0.011 *	1.000	0.011 *
Subscale 2—TARE-AB	Integration	1.50	0.58	1.75	0.50	0.495	1.50	0.58	3.75	0.50	0.017 *	1.000	0.015 *
	Transfer	0.00	0.00	0.00	0.00	1.000	0.25	0.50	2.00	0.00	0.011 *	0.317	0.008 **
	Empowerment	0.50	0.58	0.00	0.00	0.127	0.50	0.58	3.75	0.50	0.017 *	1.000	0.011 *
	Teacher-student relationship	1.00	0.82	0.25	0.50	0.155	1.25	0.96	4.00	0.00	0.013 *	0.647	0.011 *
	Physical activity	0.00	0.00	0.00	0.00	1.000	0.00	0.00	2.75	0.50	0.011 *	1.000	0.011 *
Subscale 3—TARE-AB	Respect	1.50	0.58	1.75	0.50	0.495	2.00	0.00	4.00	0.00	0.008 **	0.127	0.011 *
	Participation	1.25	0.96	1.75	0.50	0.405	1.75	0.50	3.50	0.58	0.017 *	0.405	0.017 *
	Effort	1.25	0.96	1.50	0.58	0.752	1.50	0.58	3.50	0.58	0.018 *	0.752	0.018 *
	Self-direction	0.25	0.50	0.00	0.00	0.317	0.75	0.96	3.25	0.50	0.017 *	0.405	0.011 *
	Caring	0.25	0.50	0.00	0.00	0.317	0.75	0.50	3.25	0.50	0.015 *	0.186	0.011 *
	Movement	0.00	0.00	0.00	0.00	1.000	0.00	0.00	3.75	0.50	0.011 *	1.000	0.011 *
Interpersonal teaching style	Autonomy support style	2.74	0.38	2.88	0.28	0.082	2.66	0.37	4.02	0.37	0.000 ***	0.035 *	0.000 ***
	Controlled style	3.35	0.49	3.22	0.49	0.162	3.42	0.43	2.24	0.35	0.000 ***	0.034 *	0.000 ***

Legend: *** $p < 0.001$; ** = $p < 0.01$; * $p < 0.05$.

4. Discussion

The main objective of this study was to evaluate the implementation of an interdisciplinary educational program based on the combination of TPSR and AB within the general educational context.

Regarding the first of the specific objectives under study, the feasibility of applying the TPSR + AB program in the school context was adequate, based specifically on the total adherence displayed by the participants from the beginning to the end of the study. This is reflected in the results of the different scales of the TARE–AB instrument, a tool considered reliable by various studies [4,52]. In our case, the teachers of the EG improved in all the categories of the instrument, except for three of the variables that did not reach statistical significance, probably due to the high initial values (such as a modelling respect or assigning management tasks) or high standard deviation (such as opportunities for success). In this sense, we can say that adherence to the study was high, unlike the study by Escartí et al. [4], including a significant improvement in aspects such as transfer or leadership, more typical of the TPSR methodology. As in our study, Camerino et al. [40], using a similar sample size to the present study of 40 sessions and 4 teachers (48 sessions and 4 teachers in our study), found improvements in all the behaviours reflected in the TARE for novice teachers. Regarding AB, Watson et al. [25] indicate a low reliability in their implementation, unlike these same authors in 2019 [31] or the study by Muñoz-Parreño [32]. In our study, the items included to assess the AB showed improvement as the intervention progressed, indicating high fidelity on the part of the teachers. The same is true in terms of loyalty in AB, using the adaptation of the IEDA instrument [22], thus showing that when teachers assiduously adhere to a program such as the TPSR + AB, they are able to improve their way of teaching and carry out their continuous monitoring work [8], vital in ensuring fidelity in any successful intervention [27].

Regarding the second of the specific objectives, the teachers' use of pedagogical strategies and the behavioral response of their students, our study indicates that in addition to achieving a high degree of loyalty on the part of teachers, all behaviour observed in students improved significantly in the post-test within the EG group, as compared to the CG. In this study, the values of the TPSR (respect, participation, effort, autonomy and helping others) and AB (movement) were analyzed, something that had not been done previously. Although Camerino et al. [40] verified with an instrument similar to the TARE adapted to students, how students improved their values of respect, cooperation, helping others and leadership correlated with the items evaluated with the participating teachers. Similar results were obtained by Merino-Barrero et al. [53], where both teachers and students made greater use of TARE strategies in addition to improving their intention to be physically active. In this aspect, Muñoz-Parreño et al. [22] analyzed the values of physical activity through accelerometry and found very positive results with the implementation of AB. In our case, this type of analysis was not used, but the conclusions show similar results. This same author, in his doctoral thesis, elaborated an ad-hoc checklist to analyze AB through systematic observation, which gave rise to the IEDA instrument. From this instrument, certain strategies were selected for the present investigation, elaborating the TARE–AB instrument. Specifically, class structuring, participation and promotion of physical activity by teachers (subscales 1 and 2) and movement in students (subscale 3), all improved significantly after the programme.

Third, comparing the results of the teachers of the EG and those of CG, we must highlight that initially there were no significant differences in any of the variables of any of the groups, neither in the TARE + AB instrument, nor in the values of autonomy support or the controlling style. This shows that the improvements noted in the present study are due to the intervention carried out, with the fundamental use of AB [32] and the TPSR using the TARE within the classroom and in Physical Education classes [40]. As in our study, Merino-Barrero et al. [53] saw how practically all the strategies used by the EG obtained statistically significant differences with respect to CG by the end of the intervention, while both groups had initially shown no differences. Regarding the AB,

although the values of physical activity with accelerometry were not analysed, the reflected instrument indicated that the teachers of the EG identified an improvement in the values of movement, participation and physical activity of their students, unlike those of the CG. All this can be extrapolated to the benefit of the students since there are several studies that have seen how these values can influence the physical activity of students [54,55] with the consequent benefits in the prevention of obesity [56] and the reduction of joint pain [57], in addition to cognitive variables such as executive functions and academic performance [32], a reduction in distractions [58] and greater retention capacity [59]. As for responsibility, it is already known that it improves aspects related to motivation or basic psychological needs when applied to the general educational field, as well as the school social climate [1]. There is also a link with an improvement in physical activity, especially mediated by increases in responsibility, as shown in the study by Merino-Barrero et al. [53].

There are studies that, although they verified improvements after the application of programs such as the TPSR in the EG, also found variables that improved in the CG, which may be considered a limitation in extrapolating results. However, what is clear is that it is essential, in any intervention, to ensure that the results are due to the protocol followed [60]. In our study, we can conclude that this was not an aspect that could influence the results.

Finally, regarding the students' perception of the interpersonal style of their teachers, it was observed that in the EG, there was improvement in their perception of the values of autonomy ceded by teachers. Contrasting these aspects with the CG, initially both groups were homogeneous, but after the intervention the CG's results worsened (increased perception of controlling style and reduced autonomy support) while the EG demonstrated a positive change in support for autonomy and a reduction in controlling style. Other research, where a teaching approach that gives greater autonomy to the student is sought, have indicated similar results [61–63]. The application of the TPSR with primary education students has also resulted in the identification of greater autonomy on the part of the students [1] as well as a greater perception of autonomy and a reduction in the perception of control of students [13], the same as in other educational stages such as secondary education [53]. This is probably because one of the main objectives of the TPSR is to seek the transfer of autonomy in the teacher's strategies [64]. This type of methodology is clearly essential in promoting the transfer of autonomy in order to achieve positive consequences among students [17]. The use of TPSR to promote autonomy has already been documented, but a novelty of this study is that there is no research that has assessed the implementation of AB in this aspect or hybridizing it with TPSR. The transfer of autonomy is fundamental when performing certain exercises as well as being able to choose what activities to carry out. This is similar to what would happen at level 3 of autonomy in the TPSR.

5. Conclusions

The TPSR + AB hybrid model in the educational context has shown itself to be highly applicable in classes, thereby improving the range of strategies open to teachers, whether in their complete form or hybridized. All this is possible thanks to an intervention that requires continuous monitoring and commitment on the part of the participating teachers, with an exhaustive control of the sessions and the academic contents being fundamental.

Teachers of the EG managed to improve values of respect, participation, effort, autonomy, helping others and movement during classes with their students, all of which can have a positive impact on their well-being in classes and outside of them.

In addition, the use of AB together with the TPSR increased the support for autonomy perceived by students and a reduction in the controlling style, an important aspect if students are to be able to develop self-sufficiently outside of the classroom now and in the future.

The main limitation of the study is the small sample size, which could have influenced the results. Moreover, the sample has been selected for convenience and accessibility, therefore, we cannot ensure that it is representative of the population under study. Another aspect is the possibility of analysing more variables with the questionnaires, in addition to

the interpersonal teaching style or the use of accelerometry to check the levels of physical activity during classes with the use of AB. The use of combined instruments could have been considered to assess the FOI, using a system such as the OSTOR for the TPSR [40]. In addition, interviews or other instruments could have been used to verify the perception of teachers and students of the intervention programme (social validity) as well as offering improvements. Finally, the intention to be physically active could have been included in the questionnaires, in order to check whether the use of AB also motivated future and present physical activity outside the classroom.

As implications and future lines of research, the application of methodologies such as TPSR + AB is recommended, hybridizing active methodologies that may also have a place in the classroom due to their compatible characteristics. In the specific case of our study, its extension to other educational stages may be of great interest, as well as the possibility of using it in extracurricular activities such as language or music classes, including higher levels of physical activity in students, in addition to the benefits reported above.

It is considered fundamental that AB-based programmes carry out specific training and follow-up of classes, because the teachers who apply the methodology are not usually teachers specialized in PE and need greater support to specify the resources and strategies to be used [18,25]. Regarding the use of TPSR, studies such as the one by Manzano-Sánchez et al. [65] indicate that not only is adequate initial training necessary [4,7], but continuous training and monitoring must also be carried out, especially with new teachers. Finally, it is suggested that future studies use more objective measures to assess physical activity-related FOI, such as accelerometers or heart rate monitors, to complement the observational analysis of students' and teachers' behaviours.

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