

Physical activity and movement integrated into the second language teaching from an early age: a systematic review

Actividad física y movimiento integrados en la enseñanza de una segunda lengua desde una edad temprana: una revisión sistemática

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Abstract: Background: the main objective of this paper is to analyse the effectiveness of physical activity and movement based intervention programmes for teaching and learning a second language (L2) in early childhood, also providing an overview of the current state of the art. Methods: the study presents a systematic review, paying special attention to the scientific literature that combines and integrates in the classroom, physical activity and the contents of the Physical Education curriculum, for the teaching of the L2. The Web of Science (WOS), Scopus and ProQuest have been used as databases, obtaining a total of 14 scientific articles closely related to the subject of the work, published between 2001 and 2020. Results and Conclusions: The results produced following consultation of different search engines reveal that, on the one hand, there is scarce research on this topic and, on the other hand, there is a positive influence of physical and / or expressive activities on the acquisition of a second language. This is especially the case for vocabulary acquisition and is found when comparing with conventional teaching methods.

Keywords: second language; active classroom; physical activity; physical education; early ages.

Resumen: Antecedentes: el objetivo principal de este trabajo es analizar la eficacia de los programas de intervención basados en la actividad física y el movimiento para la enseñanza y el aprendizaje de una segunda lengua (L2) en la primera infancia, proporcionando también una visión general del estado actual de la cuestión. Métodos: el estudio presenta una revisión sistemática, prestando especial atención a la literatura científica que combina e integra en el aula, la actividad física y los contenidos del currículo de Educación Física, para la enseñanza de la L2. Se han utilizado como bases de datos la Web of Science (WOS), Scopus y ProQuest, obteniendo un total de 14 artículos científicos estrechamente relacionados con el tema del trabajo, publicados entre 2001 y 2020. Resultados y Conclusiones: Los resultados arrojados tras la consulta de diferentes buscadores revelan que, por un lado, hay escasa investigación sobre este tema y, por otro, existe una influencia positiva de las actividades físicas y/o expresivas en la adquisición de una segunda lengua. Este es el caso, especialmente, de la adquisición de vocabulario y se constata cuando se compara con los métodos de enseñanza convencionales.

Palabras clave: segunda lengua; aula activa; actividad física; educación física; edades tempranas.

Introduction

Childhood stage is essential to a person's holistic development. Regular physical activity (PA) practice at children's years is essential for physical and social development, skeletal health, psychosocial health and cognitive development (González-Valero et al., 2020; Stanley et al., 2016; Timmons et al., 2012). Therefore, understanding the recommended PA for healthy growth is essential (Carson et al., 2017).

Many studies have confirmed benefits of regular PA, in particular moderate to vigorous PA, over the 5-17-year age range. Nevertheless, few studies determine the benefits of regular PA at age 0-4. The guidelines,

for early ages, establish for healthy growth and development, that infants (<1 year) should be physically active several times a day, and children from 1 to 4 years, should accumulate at least 180 minutes of PA daily, of any intensity. After age 5, the intensity should increase to 60 minutes per day of vigorous activity (Tremblay et al., 2012).

However, limited data available on literature suggests moderate to vigorous PA is always considered to be favourable (Piña et al., 2020), but does not clarify the intensity, duration and type of activity required for healthy PA. On the other hand, recent studies by Colley et al. (2013), Hnatiuk et al. (2014) and Hesketh et al. (2014), reveal some evidence that preschoolers tend to have low intensity PA. These findings suggest an increased level of PA in children from an early age and planning appropriate PA programmes.

Childhood and schooling environments are very

important for promoting healthy habits. Historically, PA opportunities in school have been provided mainly through physical education lessons and at break times (Vazou et al., 2020). Although research shows no minimum standards are achieved and few programmes or educational systems promote PA (Stanley et al., 2016; Soltero et al., 2019).

According to Bedard et al. (2019) and Vazou et al. (2020) an innovative strategy currently being used in schools' concerns incorporating movement and PA into classrooms, also called active classrooms, understood as a process of introducing exercise, at any level of intensity, into regularly scheduled class time (Webster et al., 2015). In order to achieve both learning outcomes in the classroom and time spent on PA. PA and movement are intentionally combined with academic lessons of essential content. Active breaks, taken during academic lessons as well as in moving from class to class, are part of this framework, and teaching academic content through movement to increase PA opportunities (Bedard et al., 2019; Russ, et al., 2016). The studies following that approach have found benefits in students' PA, as well as in cognition, classroom performance and academic outcomes, and did not decrease PA in general, or influence school performance in any way (Bássoli et al., 2021; Naylor et al., 2015; Owen et al., 2016; Watson et al., 2017). Supporting this theory, PA integrated into classrooms is educational and can promote health (Webster et al., 2015).

Even though there are few studies, a positive correlation exists between PA lessons and academic performance as contrasted with traditional sedentary lessons (Bedard et al., 2019; Norris et al., 2015). In addition, for health benefits, movement and PA have positive effects on brain development and learning ability, as well as facilitating a child's executive function relevant to academic achievement (Milne et al., 2018; Tomporowski et al., 2008). Accordingly, taking into account PA academic lessons as a form of cognitive demand exercise, it is possible as well these lessons can lead to better cognitive and academic performance, in special when these programmes add psychosocial mechanisms, increasing students' motivation and interests for learning (Diamond & Ling, 2016; González-Valero et al., 2019).

In recent years, emerging interest in learning a second language (L2) from an early age, especially English (Coyle & Ferez 2018; Sánchez-Vegas et al., 2022), has turned it into a priority in European educational policies (European Council of Lisbon, 2000).

This gives the educational administration the responsibility of promoting an approach for the learning of a second language, beginning during the Early Childhood Education. This emphasizes the need to work on this aspect throughout the teaching-learning process, starting from an early age. Learning a second language, therefore, is essential. Further, it is highly recommended to introduce the language at an early age when children are more linguistically sensitive. As a consequence, the learning process is facilitated (Lockiewicz et al., 2018) and successful learning is more likely during later stages (Kuhl, 2011).

It has been proven that early learning achieves better results, even in other curricular areas such as mathematics (Mavilidi et al., 2015; 2019), and generally results in better academic performance (Janssen et al., 2014; Pow et al., 2016; Mavilidi et al., 2019; Zambrano et al., 2021). On the other hand, studying a language from Early Childhood Education is related to an improvement in the ability to listen and a more precise and correct pronunciation of the language. It also improves communication, tolerance of other cultures and strengthens self-esteem (Álvarez 2010; Pino & Rodríguez 2010).

Toumpaniari et al. (2015), highlight that there has been a link between the mind and the body since ancient times. They demonstrated that mental health is closely related to PA, with the latter being an essential aspect of teaching. Different studies provide data on evidence indicating that increased PA leads to increase academic goals (Howie and Pate 2012; Sibley & Etnier 2003), which is also evident for different language learning skills (Castelli et al., 2007; Taras, 2005). In addition, there are intervention studies in children that obtained significant improvements in oral and written language acquisition when using teaching strategies that integrate PA and language learning (Derri et al., 2010). That is why mental health is worked on in both a transversal and direct way during Early, Childhood Education. The basis of learning at this stage resides in the body and in movement, with gestures, games, sensory-motor activities, experimentation and representation, amongst others, being essential resources in the teaching-learning process. Specifically, game playing is the tool that most favors and facilitates learning. As a result, it should be at the core of work organization given its ability to motivate and create a pleasant environment, alongside its flexibility at an organizational level and its safety of action (Boquete, 2013; Hernández-Martínez & González-Martí, 2013; Rodríguez-Pérez, 2012). All of above leads

to the overall conclusion that learning with motor skills and activities, in other words, activities that are linked to experience and are associated with emotions, build more significant learnings (Billak, 2013; Rodríguez-Pérez, 2012; Viciano et al., 2017).

Subtle movements, such as gestures, when meaningful and integrated into the learning task, produce positive results in the learning of different cognitive tasks such as mathematics, language (Mavilidi et al., 2015; Tellier, 2008). «An explanation for the positive effects on learning is that embodying knowledge through making gestures results in a distinct, visuospatial representational format that can enrich the way information is coded, i.e., the construction of higher quality cognitive schemas» (Mavilidi et al., 2015, p. 415).

The positive link between PA and academic performance has been established. It has been used as an effective tooling teaching for the development of cognitive contents (Hillman et al., 2011; Singh et al., 2012) as game playing and movement are significant resources for students, with subsequent improvements in attention and motivation towards learning (Janssen et al., 2014).

Below, we provide an overview of some methods of second language teaching that include motor and multisensory activities that were developed with children of early ages. Indeed, these methods have an enriching and global character, covering the diverse capacities of students and leading to comprehensive learning (Arbolea, 2016). They simultaneously stimulate various sensorial functions such as sight, hearing, touch and kinesthetics, thus integrating all psychomotor functions (Bogdanowicz, 2014; Bogdanowicz et al., 2015). Using motivating and meaningful resources with children from young ages, such as stories and movement/action songs, and activities accompanied by significant gestures and rhythmic activities (Albadalejo et al., 2018; Campfield & Murphy 2013), are good examples.

The development of rhythmic skills, through motor activities and tasks with rhythmic processing, such as the use of songs, poems and rhymes (Salvador-García et al., 2017), enhances rhythmic development. This occurs both through the increased motivation triggered in the child, and improved auditory rhythmic processing, skills related to phonological awareness and literacy skills (Corriveau & Goswami 2009; Moritz et al., 2012). These examples can be transferred to the learning of other languages and allow for the teaching of them to be initiated at an early age (Cameron, 2003; Campfield & Murphy 2013). Along similar lines the «Good Start

Method for English» aims to stimulate different senses (visual, auditory, motor and touch) combining language learning with visual, graphic and motor elements. This guarantees mental and motor development of the child, increasing the effectiveness of learning. Children with well-developed auditory-motor synchronization, improve their phonological processing skills and knowledge of the order of words (Bogdanowicz et al., 2015).

Another method is the «Total Physical Response» (TPR) devised by Asher (1969), which takes learning of the mother tongue as its basis. It was created following observations that children first acquire a good level of listening and understanding, and later produce language. The principles of TPR were established in imitation of this observation, which basically consists of listening to initiated at slogans and representing them physically (through imitation of gestures and actions). Following various interventions it was concluded that this method led to a greater speed of understanding the language relative to simply observing it, or carrying out traditional learning methods (Kalivoda et al., 1971).

Total Physical Response methodology creates an environment of motivation and safety in the classroom. This encourages participation of children in the representation of objects, animals and mainly actions, in addition to other activities such as songs which improve child development at a linguistic and cognitive level. These types of activities provide students with a degree of freedom (since they can move) and, as a result, an atmosphere of enthusiasm and fun is created. This is in addition to the activity being attractive and meaningful for learning (Al Harrasi, 2013). Finally, as the majority of activities nowadays involve carrying out teachers' orders to the letter, the resultant lack of creativity has been widely researched as an obvious shortcoming. In relation to the aforementioned, the «Energizers» program (Mahar et al., 2004) has been described to work on any type of content (addresses, animals, health, languages, etc.) through PA. This method was designed to be used in Early Childhood Education up to the 5th year of Primary Education. It consists of conducting brief physical education sessions (approximately 10 minutes) in the classroom which integrate any type of academic content (Mahar et al., 2004; Mahar et al., 2006). Through a number of studies carried out by the authors of this method, it has been proven that the «Energizers» program (Mahar et al., 2004), considerably increases PA, whilst also improving classroom behavior. This leads to an improvement in academic results and greater

teacher satisfaction, not forgetting increased motivation and concentration in students (Mahar et al., 2006).

Another of the methods which is widely accepted by authors agree to be effective for teaching a second language, is learning accompanied by significant gestures. Essentially, participants code important verbal information through gestures which subsequently results in a better recognition and recall of such information (Tellier, 2008). This is endorsed by other authors such as Mavilidi et al. (2019) and Toumpaniari et al. (2015), who sustain that the combination of this methodology with PA bears positive results both cognitively and physiologically. But above all, its importance lies in the fact that children, mainly at the preschool stage, need and prefer to have a more active routine and learn things in a more symbolic way. On the other hand, in comparing the results of various studies conducted by Chlapana and Tafa (2014), it is certified that learning with the accompaniment of gestures has more positive results than with the accompaniment of pictograms and that both, in turn, are better than traditional learning methods. This led to the conclusion that motor activity is one of the best supports for learning. In order for this to happen, however, it is necessary that the corporal activity is significantly linked to the content to be learned (Pouw et al., 2016).

Further, leading on from current trends in teaching varied content through the use of movement, we see the emergence of second language teaching through PA (Mavilidi et al., 2019). It can be seen that an integrated approach to PA based on motor games and foreign language teaching, produces significant improvements in specific vocabulary and listening comprehension (Krüger, 2018). On the other hand, an integrated program using sessions focused on physical fitness, sports and body expression improves attention and student motivation, leading to improvements in the understanding and knowledge of messages in English (Cepero et al., 2013; Mavilidi et al., 2019).

Linking PA with other disciplines of the curriculum is based on the idea that merging contents leads to academic improvements and increases the quality and acquisition of learning in both subjects (Alcedo & Chacón, 2011; Mavilidi et al., 2015). On the other hand, Toumpaniari et al. (2015) and Mavilidi et al. (2019), indicated that PA, apart from evidencing an academic improvement, also involves and educates children about the need to carry out healthy habits. In the present day, this is key to fighting against the ever increasing emergence of lifestyles that are characterized by

monotonous sedentary routines.

Methods

Objective

The purpose of this study is to conduct a systematic review focused on identifying general characteristics, and effectiveness of intervention programs carried out in the educational context, which have used methodologies based on multisensory and motor activities for teaching a second language from an early age. It is intended to give an overview of the current state of the situation.

Search Procedure

The present study follows the guidelines laid out in the PRISMA statement (Preferred Reporting Items for Systematic reviews and Meta-Analyses) (Hutton et al., 2015; Urrutia & Bonfill, 2010). A literature search was conducted during the months of February and October 2019, using the Web of Science (WOS), Scopus and ProQuest databases as primary search engines. For the initial selection of articles, those references that used intervention programs for the teaching of a foreign language in the school environment were analyzed. The terms «foreign language», «multisensory learning», «active classroom», «motor activities» and «physical education» were used as keywords, including «and» as a Boolean operator. Any restriction was established in the search for articles due to the low number of publications on the subject. Once the study population was established, the search was refined and the knowledge area «Social Science» was applied as a filter.

Study selection criteria

The following inclusion criteria were established to select the study sample: (1) studies that intervened from an early age; (2) studies that took place in the classroom; and (3) used PA and/or physical education content as a resource for teaching a foreign language. These criteria were initially applied through a critical reading of the title and the summary of the study population. Subsequently, a systematic reading of the full text was carried out to consider the criteria in their entirety. 140 were discarded after the application of the criteria described above. Finally, the selected articles were organized and an identification number was applied.

Population and sample

Following application of the aforementioned process,

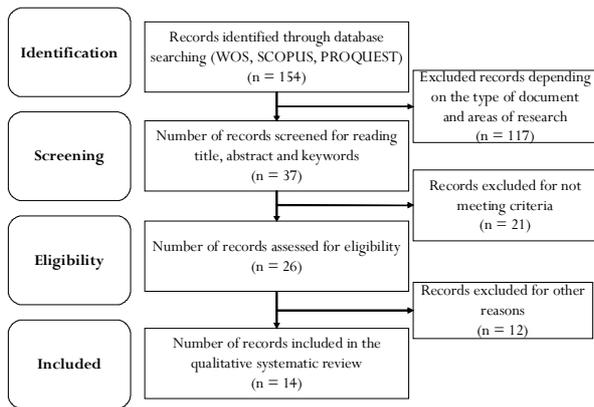


Figure 1. Flowchart of the study selection process.

the population of this study corresponded to 37 scientific articles. After considering and applying the inclusion criteria, the final sample of this review corresponded to a total of 14 scientific articles (Figure 1).

Data extraction procedure

The data of the studies were extracted on the basis of the units of analysis and using a codification. For the main characteristics of the study sample (table 1) the following coding was used: (1) Author/s; (2) Year of publication; (3) Sample; (4) Educational context; (5) Age; (6) First language; (7) Second language. For the treatment of the data and main study results (table 2) it was codified around (1) research design; (2) intervention time; (3) learning strategies; (4) variables; (5) measuring instruments; (6) conclusions (Table 2).

This study was coded by two of the authors, in order to verify the reliability of the coding and the degree of agreement among the researchers for the selection and extraction of the data (González-Valero et al., 2019). The degree of agreement obtained in the classification of the articles was 93%, which was obtained by dividing the number of coincidences by the total number of categories defined for each study and multiplying it by 100. In addition, the statistical measure Kappa by Fleiss (Kf) was used to establish the methodological quality and the reliability of the data for the review of more than two evaluators (Fleiss, 1971). In this sense, a value of $Kf = 0.705$ was obtained for the selection and data extraction, which indicates that there is a substantial agreement (0.61-0.80).

Results

Data from studies selected for systematic review

The sample of this systematic review consists of 14 articles in which a total of 759 subjects had participated. The following coding process was used for the extraction of data: (1) author / s; (2) year of publication; (3) registered sample; (4) educational context; (5) age; (6) first language (L1); (7) second language (L2) (Table 1).

The following coding process was used for the extraction of data from the interventions analyzed: (1) research design; (2) intervention time; (3) learning strategies; (4) variables; (5) measuring instruments; (6) conclusions (Table 2).

Table 1.

Data related to the selected studies.

N°	Authors	Year	Sample*	Educational Context	Age	L1	L2
1	Coşar and Orhan	2019	32 (17M/ 15F)	Primary	6	Turkish	English
2	Padial-Ruz et al.	2019	88 (40 M/48 F)	Childhood education	4-6	Spanish	English
3	Wulandari	2019	11	Childhood education	NP	Indonesian	English
4	Albaladejo et al.	2018	17	Childhood education	2-3	Spanish	English
5	Kröger	2018	61 (34 M /27 F)	Primary	6-10	Spanish, Irani, Italian, Romanian, Syrian and African	German
6	Porter	2016	40 (22M/18 F)	Childhood education/ Primary	4-7	English	French
7	Mavilidi et al.	2015	125 (64M/61 F)	Childhood education	4-5	English	Italian
8	Nekoui	2015	40 (20 M/20 F)	Primary	9-10	Iranian	English
9	Toumpaniari et al.	2015	67 (30 M/37 F)	Childhood education	4	Greek	English
10	Chlapana and Tafa	2014	87(42 M/45 F)	Childhood education/ Primary	4-6	Albanian, Bulgarian, English, Romanian, Arabic, Turkish, Dutch, Russian	Greek
11	Campfield and Murphy	2013	87 (57 M/30 F)	Primary	8	Polish	English
12	Cepero et al.	2013	23(16 M/ 7 F)	Primary	10	Spanish	English
13	Tellier	2008	20	Childhood education/ Primary	5-6	French	English
14	Uilenburg et al.	2001	61	Childhood education/ Primary	4-6	NP	Dutch

Note: Males (M); Females (F)

Evolution of scientific production

Within the different databases consulted only 14 articles implementing intervention programs with methodologies based on multisensory or motor activity were published during the period 2001-2020. Of these, a greater number of studies were produced between 2015 and 2019, representing 64.3% of total production (Figure 2).

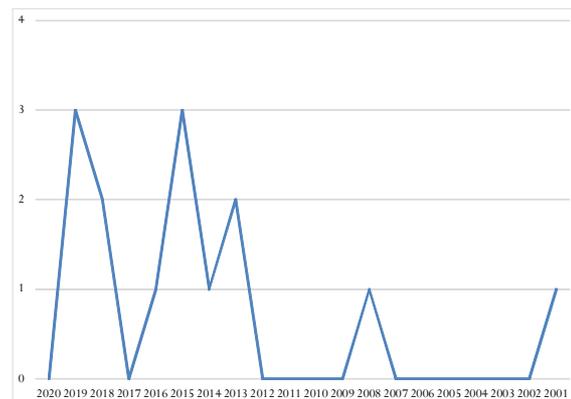


Figure 2. Evolution of scientific production from 2001 to 2020

Scientific production according to age and educational stage

Reviewed studies reported on interventions that had been carried out at the following educational stages Childhood Education and Primary. No study was

Table 2.

Data relating to the interventions analyzed

N°	Research Design	Time	Learning Strategies	Variable	Measuring Instruments	Conclusions
1	Quasi-experimental (CG/EG) Pre-test/Post-test	8 weeks	CG: Verbal communication and classical methods EG: TPR (play/physical exercise/movements)	Vocabulary learning and motivation	16-question multiple-choice	Physical Response Method applied in Physical Education and Play was more effective, fun and motivating for students in learning English vocabulary than traditional foreign language teaching methods.
2	Quasi-experimental (CG/EG) Pre-test/Post-test	5 weeks (10 hours)	CG: Flashcard; EG1: Gestures; EG2: Gestures + Motor Games	Vocabulary learning and motivation	Vocabulary Verification Checklist The Smyle Scale (Jäger & Bortz, 2001)	Motor and expressive activities produce more effective learning of vocabulary related to a L2 at an early age and are an effective motivational resource for learning.
3	Pre-experimental (EG) Post-test	4 weeks	Active play strategies Listening and repeat activities Games	Vocabulary learning	Performance evaluation instruments Observation sheets Interviews	Active play strategies increase preschoolers' English vocabulary skills and create a meaningful and interactive environment.
4	Pre-experimental (EG) Pre-test/Post-test	3 weeks	EG1: Stories; EG2: Songs EG3: Stories + Songs; (all conditions used gestures)	Vocabulary learning	Standard method (Dunn & Dunn, 2007)	Learning vocabulary through narratives is more effective than listening to songs or combining both resources.
5	Quasi-experimental (CG/EG) Pre-test/Post-test	Six lessons (9 h)	PE Integrated L2 Learning Strategies (Motor Games)	Domain specific vocabulary Listening comprehension Use of local prepositions	Intelligence test for children and adults (Tellegen et al., 2012) A1-level language test	An integrated approach to Physical Education and L2, produces significant improvements in specific vocabulary mastery and listening comprehension.
6	Pre-experimental (EG) Pre-test/Post-test	3 weeks (45min/w week)	Story 1 (without gestures) Story 2 (with gestures)	Memorisation of target language	Video and oral tests	Formulaic chunks of language in L2 are better memorized by young learners through the combination of pictures and gestures than by only using pictures. However, there is a greater attrition when the learning is carried out through gestures.
7	Experimental with repeated measures	4 weeks (2 h)	EG1.Integrated; EG2.Non-integrated; EG.3 gesturing; EG4. conventional	Vocabulary learning	Free-recall test Cued recall test	Adding gestures or physical exercise to learning cognitive tasks leads to better learning than with conventional strategies.
8	Quasi-experimental (EG) Pre-test/Post-test	12 weeks (1,30h)	EG1: Direct Method EG2: TPR (gestures, physical movements, acting) Both groups: Book, flashcards, pictures and songs	Vocabulary learning	Oral pre-test and post-test Field notes	The TPR produces significant vocabulary learning improvement in the L2. In addition, this method leads to a better L2 vocabulary learning ability than the Direct Method does.
9	Pre-experimental (CG/EG) Post-test	4 weeks (8 h)	CG: Conventional Learning EG1: Gestures; EG2: Gestures + Motor Games	Vocabulary learning and Motivation	Vocabulary Verification Checklist The Smyle Scale (Jäger & Bortz, 2001)	Learning using gestures alongside physical activity produces better learning results than with conventional learning.
10	Experimental (CG/EG) Pre-test/Post-test	2 weeks	CG. Read Stories; EC1. Direct instruction Gestures EC2. Interactive Instruction	Vocabulary learning	Target Vocabulary Test (TVT) based on (Dunn & Dunn, 1981)	Interactive instruction had a greater impact on instructed word learning than direct instruction (gestures).
11	Experimental (CG/EG) Pre-test/Post-test	3 weeks (12 h)	CG. Non-intervention EG1. Rhythm Group EG2. Prose Group	Non-verbal IQ Vocabulary learning	Raven's Colour Progressive Matrices British Picture Vocabulary Scale (Dunn et al., 1997)	Rhythmic intervention improves knowledge of the order and function of words in L2 and increases motivation.
12	Pre-experimental (EG) Post-test	2,5 weeks	PE Integrated L2 Learning Strategies Motor Games	Language skills Motivation	Teacher's diary Digital portfolio	The program improves knowledge of English and increases student attention and motivation.
13	Pre-experimental (EG) Post-test	4 weeks	EG1. Pictures EG2. Gestures	Vocabulary learning	Show appropriate picture or gesture Produce the appropriate word	Gestures and especially their reproduction significantly influence the memorization of L2 lexical items as far as the active knowledge of the vocabulary is concerned (being able to produce words and not only understand them).
14	Quasi-experimental (CG/EG) Pre-test/Post-test	24 weeks	CG. Code-oriented method (stories read by the teacher, audiocassettes with stories, word cards, murals and comics of the stories). Occasionally psychomotor activities EG. Format-based method (acting of format scripts, storybooks, songs)	Receptive and productive vocabulary Sentence building and understanding Morphology Comprehension of texts Sound articulation Sound discrimination	TAK test (Boogaard et al., 1990; Van de Guchte, Verhoeven, & Vermeer, 1986) Method-bound receptive test and productive vocabulary test Audio recording	Format-based activities produce better results in discrimination and sound articulation tasks than code-oriented activities.

identified which had been carried out at the Secondary education stage (12-16-year old). With regards to educational stage, there is a balance, although the greatest number of interventions had been carried out during the Primary Education (N= 6) stages, representing 42.9% of all publications (Table 3).

Scientific production according to intervention time, intervention methods used

The duration of intervention programs carried out in the different studies is diverse. Studies reported programs which ranged from as short as 2 weeks (N=1), up to 2 year (N=1). Most studies reported interventions which lasted between 2-3 weeks (N=6) and 4-9 weeks (N=6), with values being represented in Table 4.

The learning strategies used within each intervention program are diverse. We have therefore grouped them

into two blocks: PA (motor skills, basic physical abilities, sports, motor games) and expressive activities (representation, gesture, rhythm, song and story). Expressive activities (N=6) were reported more often than physical activities (N=5), with values being represented in Table 5.

Table 3.

Scientific production according to educational stage.

Educational Stage / Age	N° of Studies	Percentage
Childhood Education (2-5)	N=5	35.7%
Primary Education (6-10)	N=6	42.9%
Childhood Education/ Primary Education	N=3	21.4%
Total	N = 14	100%

Table 4.

Scientific production according to intervention duration.

Intervention Time	N° of Studies	Percentage
2-3 weeks	N=6	42.9%
4-9 weeks	N=6	42.9%
12-24 weeks	N=2	14.2%
Total	N=14	100%

Table 5.

Scientific production according to learning strategies.

Learning Strategies	N° of Studies	Percentage
Expressive Activities	N=6	42.9%
Physical Activity	N=5	35.7%
Physical Activity and Expressive Activities	N=3	21.4%
Total	N=14	100%

Regardless of the method applied, when evaluating programs the most measured variable was the vocabulary acquired by students (N=10), with English being the L2 most evaluated in the programmes (N=9). Some studies (N=4) also measured motivation towards the teaching strategies used.

The most widely used instruments for measuring vocabulary learning have been the vocabulary checklists. N=4 studies used instruments with verified validity, namely adaptations of Peabody Picture Vocabulary Test (PPVT) (Dunn, 1986).

The research designs used are three, pre-experimental (N=6), quasi-experimental (N=5) and experimental (N=3), with smaller samples of students used in pre-experimental designs. The number of students in each sample is small, with the largest sample being 88 students and the smallest just 11 students.

Finally, with regard to the conclusions of the study, 85.7% of studies reporting on interventions in which PA and / or expressive activities were used obtained positive results in relation to the learning of a second language learning, with only two (N =2) not obtaining better results (Table 2).

Discussion

Over a number of years, early acquisition of a second language has assumed great relevance throughout Europe (Bogdanowicz & Bogdanowicz, 2016; Coyle & Ferez, 2018), due to the fact that this forms part of societies' knowledge development strategy. This can be seen in the present data through the fact that a greater number of scientific articles focused on this topic in the educational field have been produced in recent years. However, it must be acknowledged that the overall amount of relevant studies is still low.

The growing development of neuroscience and its application within the educational field provides conclusive data on the factors involved in the acquisition of a second language. One of these confirmed factors is the age at which learning begins. It is concluded that initiating teaching from an early age directly and clearly impacts upon linguistic fluency and reading when learning a non-mother tongue, this effect being reduced when learning begins at puberty (Cendoya, 2009; Kuhl, 2011). In support of this statement, the sample of articles obtained for the present study dealt with children aged between 2 and 10 years. Children at these ages are more linguistically sensitive, allowing for greater acquisition and permanence of language in the future (Griva &

Sivropoulou 2010; Lockiewicz et al., 2018).

In both behavioral and brain imaging studies, exposure to a bilingual environment has been shown to have a significant impact on simultaneous mastery of the two languages. Positive outcomes on different aspects of child development have been underlined encompassing linguistic, cognitive and literacy tasks (which are not included here). Children who experience an early, systematic and extensive exposure to two languages quickly gain mastery over the basic aspects of both in an identical manner to monolingual learners (Cendoya, 2009: 44).

Research such as that carried out by Billak (2013), and Griva and Sivropoulou (2010), show that students are able to learn a second language from an early age (2-3 years) if the learning environment is age-appropriate. However, in terms of the sample, due to early age in some studies, it is insufficient, which is a basic limitation in studies (Chlapana & Tafa, 2014). Differences in class sizes also make generalizations from available studies difficult, with some interventions in small groups (Albaladejo et al., 2018; Tellier, 2008; Wulandari, 2019) and others with a moderated number of participants (Chlapana & Tafa 2014; Krüger, 2018; Toumpaniari et al., 2015).

One of the most effective learning styles is active learning. This uses the integration of movement and PA into the academic classroom and action and experimentation through recreational, motivational and multisensory activities involving different senses (Bedard et al., 2019; Bogdanowicz, 2014; Mavilidi et al., 2015; Malividi et al., 2019; Vazou et al., 2020). It is so effective because a greater number of associations can be made with the element to be learned, improving learning and retention. Conceptual development is closely linked to motor development and experience; thus, the basis of learning experiences and the creation of meaning are based on sensory and motor participation (Volta & Volpe 2018). A number of the articles included in the present study which demonstrated the greatest acquisition of a foreign language, used programs based on multisensory activities (Ghisio et al., 2017) and motor activities such as songs and active tales, rhythmic activities (Campfield & Murphy, 2013; Hornickel & Kraus, 2013; Padiál-Ruz et al., 2019), gestures, pantomimes or facial expressions (Kalivoda et al., 1971; Padiál-Ruz et al., 2019).

The performance of significant gestures accompanied by audibly expressed words produces bilateral activation in the area of the premotor cortex. This demonstrates

that executing gestures whilst also coding verbal information has a greater impact at the memorial level (Macedonia et al., 2011; Mayer et al., 2015; Tellier, 2008) than conventional methodologies. This may be due to cortical activation, specifically of the motor and sensory area, and coincides with the theory of multisensory learning (Mayer et al., 2015). PA engagement was another method found within included work, although it is acknowledged that these articles incorporated only a narrow range of ages. This is a transversal resource for learning different curricular contents, including foreign languages (Cepero et al., 2013; Krüger, 2018; Mavilidi et al., 2019; Schmidt-Kassow et al., 2014). PA and movement improve the academic performance of students, increasing attention and, consequently, the learning and storage of memory (Hillman et al., 2011; Janssen et al., 2014). This is possible because they prime the areas of the mind which are responsible for attention. Programs such as the Energizers program use PA and movement. They are based on the performance of short (approximately 10 minutes) physical activities in the classroom in order to improve behavior and academic performance, making its use highly beneficial for both students and teachers (Mahar et al., 2006).

Finally, it is relevant to mention the work done by Mavilidi et al. (2015), Padial-Ruz et al. (2019) and Toumpaniari et al. (2015), which used a combination of physical activities and gestures to improve vocabulary learning in children aged 4 and 5, relative to other groups which used only gestures or other traditional methods. This demonstrates that memorizing words using meaningful gestures alone or combining meaningful gestures with PA both produce better results than learning with traditional methods. It is noted that the combination condition (PA plus gestures) produces the best results and is most positively valued by children. This may therefore be considered as an ideal tool for teaching from an early age.

The conclusions obtained from the reviewed studies identified improvements in academic performance, mostly measured through vocabulary learning (Albaladejo et al., 2018; Chlapana & Tafa, 2014; Schmidt-Kassow et al., 2014; Padial-Ruz et al., 2019), and general improvements in language skills (Cepero et al., 2013). This is caused by increased motivation and attention (Campfield & Murphy, 2013; Cepero et al., 2013), greater understanding of content (Campfield & Murphy, 2013; Krüger, 2018) and facilitation of memorization of verbal content (Chlapana & Tafa 2014; Macedonia et al.,

2011; Krüger, 2018). In spite of the results, the diversity in research design (sample, research design; intervention time; learning strategies; variables; measuring instruments, and the small sample of articles, further researches are needed in order to verify the positive effects of these strategies on L2 learning (Albadalejo, 2018; Chlapana & Tafa 2014; Mavilidi et al., 2015). There is still a lack of studies in the field of specific intervention programs based on the use of PA and motor strategies for improving the learning of a second foreign language suggesting that more research is needed. However, data obtained from the studies analyzed in this review reflect the effectiveness of the different interventions carried out.

Thus, results are relevant for the educational field and will facilitate the design of further investigations. Interventions should be planned, especially at the initial stages of education, which facilitate the learning of foreign languages and contribute to a reduction in sedentary lifestyles, thereby improving student health.

Finally, the main limitations of this systematic review include the search scope, which can be considered both a weakness and a strength. All studies conducted were used to provide an overview of this topic. Another limitation may reside in the exclusive selection of studies conducted in the classroom. Like the previous limitation, this screening contributes to the generation of conclusions that are determined by causality.

Conclusions

One of the most obvious conclusions reached following analysis of the studies reviewed is the insufficiency of intervention programs in the educational field which use methodologies related to PA and body expression for teaching second languages.

Moreover, the following conclusions are obtained from the analysis:

There is lack of research in younger children in early childhood settings.

All methods analyzed in the review obtained better results in relation to the learning of vocabulary relevant to the second language when compared to the use of traditional teaching methods and those which do not incorporate motor skills.

A methodology based on PA and/or meaningful gestures facilitates academic performance and motivation of students in the acquisition of a second language. This is in addition to increasing the time that students spend moving during the school period, thus

improving their health.

As a final conclusion, it has to be said that the full extent of available literature proves that learning a second language through enrichment strategies, especially those linked to motor activities (gestures, low or medium intensity PA, motor games, etc.), significantly improves the acquisition of vocabulary pertaining to a second language, whilst also boosted its subsequent recovery in long-term memory. However, in order for these types of motor-based methodologies to be extended and popularized in the educational field, more studies and experiments are necessary. Nevertheless, despite the extra effort demanded of teachers when employing these types of methodologies and the complexity of them, the improvements in children's academic and physical outcomes, alongside the high degree of motivation and satisfaction that they produce in both students and teachers, make attempts to teach a second language through motor skills worthwhile.

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