Psychomotor development and its link with motivation to learn and academic performance in Early Childhood Education

Desarrollo psicomotor y su vinculación con la motivación hacia el aprendizaje y el rendimiento académico en Educación Infantil

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Abstract

The objective of this study was to investigate the relationships between psychomotor performance, academic motivation, and academic performance in other areas of learning in Early Childhood Education (ECE). Additionally, our goal was to evaluate the link between psychomotor skills and academic performance by soliciting teachers' opinions. We used a mixed methods research design, combining quantitative and qualitative techniques. The sample included 215 children (aged 3 – 6 years) and 11 ECE teachers. The instruments used were the EMAPI test (Assessment of Academic Motivation in Early Childhood Education), the Checklist of Psychomotor Activities, interviews, and a group discussion. The teachers' reflections verified a positive relationship between psychomotor skills and academic performance in other areas. Autonomous behaviours are

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recognized as being enriched by motor skills, the relationship with the linguistic field is affirmed and logical-mathematical skills are those which benefit most from motor skills. Other results reveal that high levels of academic motivation negatively correlated with psychomotor performance. Having one sibling, however, was shown to positively influence psychomotor performance, while participation in extracurricular physical activities had no effect on this variable.

Keywords: psychomotor development, motivation to learn, academic performance, mixed methods, infant education.

Resumen

Conocer las relaciones existentes, en Educación Infantil (EI), entre el rendimiento psicomotor, la motivación y el rendimiento académico en otros ámbitos de aprendizaje ha sido el objetivo de esta investigación. Además, se busca valorar la relación entre la habilidad psicomotriz y el rendimiento académico a través de las opiniones de los docentes. Se ha utilizado un diseño de investigación de *métodos mixtos*, combinando técnicas cuantitativas y cualitativas. La muestra está compuesta por 215 niños (3-6 años) y 11 maestras de EI. Los instrumentos utilizados han sido test de motivación EMAPI, Checklist of Psychomotor Activities, entrevistas y un grupo de discusión. A través de las reflexiones de las maestras se corrobora una relación positiva entre la habilidad psicomotriz y el rendimiento académico en otras áreas. Las conductas autónomas se reconocen enriquecidas por las destrezas motoras, se afirma la relación con el ámbito lingüístico y las habilidades lógico-matemáticas se presentan como aquellas que más se benefician de la motricidad. Otros resultados revelan una alta motivación que correlaciona negativamente con el rendimiento psicomotor. Se comprueba que tener un hermano influye positivamente en el rendimiento psicomotor, vínculo que no se observa con la asistencia a actividades físicas extraescolares.

Palabras clave: desarrollo psicomotor, motivación hacia el aprendizaje, rendimiento académico, métodos mixtos, Educación Infantil.

Introduction

Among children's innate behaviours, motor skills are an inherent need that appears at birth and develop an identity of their own over the years. Motor skills become a tool for adaptation, relationship building, and interaction with the environment and other children (Uribe, 2010).

According to Rigal (2006), the concept of *motor skills* covers the set of functions that ensure the self-generated movements of a living organism (p. 15). These are motor actions that are performed voluntarily, involve the coordination of physical, cognitive, and affective factors, and improve progressively. This aspect, progression, anticipates the sense of the concepts of Larrey, López-García, Mozos, and López-Baena (2009). Those authors explain psychomotor development as a vital and complex process (p. 68), where social-cognitive development feeds back into physical changes.

In Early Childhood Education (ECE), *psychomotor development* must go beyond the physical aspects, on an upward trajectory that culminates in integration, perfection, and automation. For this reason, the teaching and learning of physical activity (PA) in ECE must follow the indications of Gil-Madrona, Contreras-Jordán, Gómez-Villora and Gómez-Barreto (2008) and extend beyond the borders of movement. Physical education links cognitive and motor functions: the development of thought and emotions (the abstract aspects) is enabled by movement (the concrete aspects), and the two are in balance (Mendiara-Rivas & Gil-Madrona, 2016).

With this holistic approach, physical education is presented as the essential thread connecting the three areas of the ECE curriculum (Spanish Royal Decree 1630/2006). The didactic proposal is characterized by a global, three-pronged organizational approach (Gil-Madrona, Contreras-Jordán, & Gómez-Barreto, 2008) that takes into account:

- *Physical-Motor Factors*: basic motor skills that aim to be effective through physical and instrumental motor skills. In this area, the command and control of the body regarding locomotor and handling skills become truly important.
- *Perceptual-Motor Factors*: motor structures that require a voluntary and sensitive mobility that, consciously, feeds the cognitive

processes. Through exploration, perception and knowledge give meaning to the restructuring of previous learning.

- *Affective-Relational Factors*: these refer to social relationships and communication. Both require affective displays through corporal expression, completed by verbal language. An environment of respect and confidence is key to learning emotional control, promoting self-esteem, and constructing a value system that enables children to develop a robust personality.

At these levels, motor control supports self-knowledge and promotes interactions with the environment. All this is driven by the desire to experiment, be amazed, and understand. According to Ospina (2006), this motivation is the driving force of learning. This motivational force therefore attains a kind of predictive capacity with regard to a child's academic achievements. The process is triggered by interest and drives behaviour towards a goal (Edel-Navarro, 2003).

When talking about the motivation to learn, different authors qualify the importance of several determinant factors: the value pupils assign to the given task, their expectations, and their self-perception of their performance (Valle, Nuñez, Rodríguez, & González-Pumariega, 2002); the levels of demand pupils set in relation to their progress and in comparison with their schoolmates, the demands of adults, and their previous performance (Blanco, 2014; Jennings, 1993); and to whom pupils attribute their successes or failures (De Caso & García, 2006). This latter determinant can lead to the distinction stated by Deci and Ryan (2008). On the one hand, these authors talk about "controlled motivation", which is ruled by external contingencies, while on the other, they cite "self-motivation", identified by being intrinsic and deeply integrated into the value assigned to the task.

If we extrapolate the effect of the motivation to learn to motor domain learning, several studies have confirmed that greater motivation leads to higher percentages of PA and to high levels of intent when practising this (Franco, Coterón, Martínez, & Brito, 2016; Pizani, Barbosa-Rinaldi, Monteiro de Miranda, & Fiorese, 2016). Those results are based on studies involving teenage participants. For this reason, it is interesting to know to what extent that data can be extrapolated to younger children. In other words, how a motivated attitude to learn in ECE, in turn, influences psychomotor performance, understood as the acquisition of motor skills through training and experience. That performance includes selecting

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and processing information, making decisions when performing tasks, and controlling answers.

The predisposition of a child towards performance is promoted with their parents' support. Parents are a triggering force of the interest in learning when their involvement and care is constant (Ghazi, Ali, Shahzad, Khan, & Hukamdad, 2010). However, the attention paid to them varies depending on the number of children, and decreases as this number increases (Marks, 2006). It therefore influences how a child faces academic challenges.

This motivation must also be part of the school's commitment, as well as the realm of extracurricular activities (Ruiz-Juan, Baena-Extremera, & Baños, 2017). Learning experiences must be given a meaning and context through different strategies, in order to increase self-esteem and improve performance (Almagro, Navarro, Paramio, & Sáenz-López, 2015).

Finally, guided by the holistic approach inherent to ECE, the assessment of a pupil's academic performance must cover the acquisition of competencies at physical, cognitive, intellectual, and social levels. These aspects are constantly interacting (Gil-Madrona et al., 2008) and converge on the motor praxeology presented by Parlebas (2008): cognitive processes enrich behaviours and become an integral part of motor actions (p. 90). This requires a combined study of both a pupil's psychomotor command and their results in other areas. This has been the purpose of the systematic searches of Keeley and Fox (2009) and Ruiz-Pérez, Ruiz-Amengual, and Linaza-Iglesias (2016). Benefits such as the contribution to social and emotional well-being, the promotion of critical thought, and the transmission of values are a constant in the findings relating to PA and its contribution to child development (Delgado & Tercedor, 2002; Archer & García, 2014; Zych, Ortega-Ruiz, & Sibaja, 2016).

Work such as that of Jiménez-Díaz and Araya (2009) addresses the ECE phase, focusing on the relationship between psychomotor development and other variables, including performance, affective regulation, and creativity. Likewise, Bernal and Daniel (2016) defend the promotion of good academic performance by means of movement, as well as the incentives to attend extracurricular physical activities (Williams et al., 2008).

PA has, therefore, a fundamental role in ECE linked to various skills. Among those, the link to logical-mathematical activities stands out in children aged 3-8 years old (Noguera, Herazo, & Vidarte, 2013). This

relationship intensifies if children take part in extracurricular sporting activities (Carmona, Sánchez-Delgado, & Bakieva, 2011). Linguistic skills are also positively influenced by gross and fine motor skills (Iverson & Barddock, 2010; Wang, Lekhal, Aaro, Holte, & Schjolberg, 2014). Moreover, there is a direct link between reading speed and good motor performance in children 6-7 years old (Viholainen et al., 2006).

In this flux of relationships, emotional skills also play a leading role (Alonso, Lagardera, Lavega, & Etxebeste, 2018). Emotions and PA are fed by an activation that is inherent, spontaneous, and natural in children. Lavega, Costes, and Prat (2015) confirm that playing is always accompanied by a positive emotional experience, and this experience increases in the case of motor games (Gil-Madrona & Martínez-López, 2016; Lavega, Filelia, Lagardera, Mateu, & Ochoa, 2013).

Among social-familiar factors that shape those relations, Gaviria and Barrientos (2001) highlight the number of siblings. It is a negative influence when the number of siblings increases, linked to economic resources or the time devoted to children. Enríquez, Segura, and Tovar (2013) notice that having two or more siblings is a risk factor associated to low academic performance.

Previous studies use objective data regarding motor skills and academic performance, particularly in mathematical and linguistic areas. Therefore, these correlations must be studied including social-emotional and autonomy aspects. Teachers shape the thoughts, expectations, and feelings of children, because of their daily contact with them, and all this has an influence on the behaviour, motivation, and performance of pupils (Funes, 2017; Villaroel, 2001). Addressing that link from a more qualitative approach, by means of teachers' opinions, provides information about processes or reasons that cannot be observed explicitly, but that somehow determine the relation between both variables.

This analysis falls within the theorical framework supported by the approaches of classical authors such as Le Boulch (2001) y Da Fonseca (1988), among others, who defend a key link between psychomotor aspects and school learning, the latter being highly dependent on a good structuring of the former.

Taking into account the state of the issue we have presented, the main goal of this study is to identify the existing relations between psychomotor performance and motivation, as well as between

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psychomotor performance and academic performance in other learning areas in ECE (3-6 years old).

Aiming at a systematic approach, this general goal is divided in the following specific goals:

1) To evaluate the motivation to learn and to assess to what extent motivation can predict motor performance in ECE.
2) To assess whether there is a relation between psychomotor skills (in the physical-motor, perceptual-motor, and affective-relational areas) and academic performance by means of teachers' opinions.
3) To ascertain whether there are relations of dependency between psychomotor performance in ECE and the number of siblings and the attendance to extracurricular physical activities.

Methodology

The research design has a *mixed approach*, as it combines quantitative and qualitative techniques to answer the complexity of the social-educational phenomena it addresses (Johnson & Onwuegbuzie, 2004). Quantifying the reality under study leads to its objective description, whereas understanding this information is enhanced by a qualitative exploration of the implicit processes (Martínez, 2007). With this pragmatic approach, we can talk about complementarity between different modes of data collection and analysis, and different informants (Driessnack, Sousa, & Costa, 2007).

Following the mixed-method research paradigm (Creswell, 2003), this method has a parallel organization for gathering qualitative and quantitative information, in order to avoid temporal mismatches, with a predominant quantitative status, according to where the emphasis is put. Likewise, it is a *descriptive, correlational transversal design* (Bryman, 2012).

Sample

The selection technique of the sample was non-probabilistic, by means of snowball sampling (Sampieri, 2014).

The children sample is comprised of 215 children 3-6 years old (M_{AGE}=3.98; *SD*=0.82) who are at the second cycle of ECE in Spanish schools. 52.6% of participants are male and 47.4% are female. This variable was categorised in three age ranges: 3 years–3 years 11 months (32.6%; *n*=70), 4 years – 4 years 11 months (38.6%; *n*=83), and 5+ years (28.8%; *n*=62). The percentage of only children (38.6%) and the percentage of children who do not attend extracurricular physical activities (19.1%) is lower than the percentage of children who have siblings (61.4%) and the percentage of children who attend extracurricular physical activities (80.9%).

The sample of teachers is comprised of 11 female teachers with an ECE degree, (M_{AGE}=45.27; *SD*=9.37). They have a mean of 21 years of professional experience (*SD*=9.19) and they are in charge of the classes of the pupils under study.

Instruments

The following instruments were used to collect data.

Scale of Motivation to Children Learning (EMAPI), comprised of 22 items with dichotomous-answer choices in pictographic form for children to choose, grouped in four motivational determinants: beliefs and expectations; value assigned to the task; level of demand regarding the actions of their classmates, their own actions and teachers' actions; and the attribution of success and failure depending on capacity, effort, luck, and difficulty of the task (Blanco, 2014). The validation of this instruments shows that it is reliable (Cronbach's alpha: 0.837) and valid (Blanco, 2017).

Checklist of Psychomotor Activities (CPA). An observation sheet comprised of 53 items, with tasks valued in a Likert scale with 5 answer options (1=never/5=always). It is a reliable instrument (Cronbach's alpha: 0.935) covering different physical-motor aspects (laterality, dynamic coordination, balance, motor execution, tonal-postural control, and respiratory control) and several perceptual-motor aspects (scheme and body image, visual-motor dissociation, and spatial orientation and structuration), as well as the affective-relational factors related to emotional control and social relationships (Romero, Ordoñez, & Gil-Madrona, 2018).

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Semi-structured interview, which allows adapting the content to the answers of respondents and delve into particular aspects.

Focus Group. A focus group was created to make a simple contrast; this group had an operational protocol in the line of the interview, adapted to the new dynamic.

Procedure

The procedure used can be divided in three stages.

Stage I. Sampling. Looking for the sample and first contact with the involved schools and teachers to explain them the goals of the study and get the appropriate consents.

Stage II. Data collection. On the one hand, the tests for the children sample (EMAPI and CPA) were applied in the children's natural context and with the presence of adults of reference. In parallel, the qualitative techniques were created, collected, and transcribed: five interviews and a focus group with six teachers.

Stage III. Data analysis. As a mixed method was used, the relevant statistical tests produce results, which are complemented and triangulated with the information from the content analysis of qualitative data.

Data processing

Within the qualitative procedure, we can distinguish three analysis blocks through IBM-SPSS v.22. In the first one, the descriptive analysis is performed by calculating the statistics mean and standard deviation, as well as the minimum and maximum values. The variables under study are analysed to verify whether they are normally distributed using the *Kolmogorov-Smirnov* test, obtaining a normal distribution ($p<0.01$) as a result.

In the second block, the nonparametric test of *Spearman's correlations* is applied in order to find the relations between the different variables under study.

In the third place, the influence of socio-demographic factors on the psychomotor performance is analysed. As the normality assumption is not true, nonparametric techniques must be used. To compare whether

a factor has a significant influence on the studied variable, we used the *Mann-Whitney U Test* when the factor is comprised of two groups, and the *Kruskal-Wallis Test* for more than two groups. Concurrently to the latter, we applied the *Mann-Whitney U Test* accompanied by the *Bonferroni correction* in order to identify between which pairs of groups or categories there are significant differences (Pardo & San Martín, 2010). We calculated the impact of the effect (Cohen's *d*) in those significant influences, interpreted according to Cohen's guidelines (1988): small effect (*d*=0.1-0.3), medium effect (*d*=0.3-0.5), and large effect (*d*>0.5).

The qualitative processing of data included recording, transcription, and coding of interviews and focus group, using the content analysis software Atlas.ti v.8. All the resulting categories and subcategories had codes assigned and were classified. From there, we triangulated the data of both qualitative techniques and created, based on the codes, the families, networks, and count of results that facilitate their interpretation.

Results

Quantitative results

Beginning with the assessment of the motivation to learn, the statistical examination shows high scores when the sample mean (*M*=40.9; *SD*=2.64) of the overall rate is near the maximum value. The differences between the sample means in the different age ranges (see Table 1) lead us to consider that motivation tends to be constant as age increases, with a slight tendency to decrease in the last range.

TABLE 1. Segmentation of motivation results by age ranges

	N	Minimum	Maximum	Mean	SD
1st Range *(3 years – 3 years 11 months)*	70	34	44	41.14	2.58
2nd Range *(4 years – 4 years 11 months)*	83	33	44	41.42	2.28
3rd Range *(5 or more years)*	62	30	43	39.92	2.92

Source: Own elaboration

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Secondly, Table 2 shows the statistical description of the findings about children psychomotor performance.

TABLE 2. Descriptive statistics of Checklist of Psychomotor Activities

	N	Minimum	Maximum	Mean	SD
Laterality		16.0	32.0	23.92	3.20
Dynamic coordination		13.0	30.0	24.51	4.89
Balance		5.0	25.0	18.98	4.39
Motor execution	215	3.0	15.0	11.88	3.41
Tonal-postural control		4.0	15.0	11.12	2.56
Respiratory control		3.0	15.0	11.26	3.04
PHYSICAL-MOTOR		**48.0**	**127.0**	**101.68**	**17.50**
Scheme and body image		12.0	20.0	18.41	2.15
Motor dissociation		4.0	15.0	11.06	2.80
Visual-motor coordination	215	7.0	30.0	21.29	6.06
Spatial orientation and structuration		4.0	15.0	12.85	2.49
PERCEPTUAL-MOTOR		**30.0**	**80.0**	**63.63**	**12.74**
Emotional control		11.0	30.0	23.99	5.24
Social relationships	215	4.0	20.0	15.02	2.78
AFECTIVE-RELATIONAL		**17.0**	**49.0**	**39.02**	**7.74**

Source: Own elaboration

Spearman's correlation test between motivation to learn and psychomotor performance shows a negative sign in all correlations, obtaining significant correlations in all three areas: psychomotor (r_s=-0.35; p<0.01), perceptual-motor (r_s=-0.31; p<0.01), and affective-relational (r_s=-0.25; p<0.01). The general tendency indicates that high scores in motivation generally correlate to a low motor performance, and vice versa.

Regarding the influence of different factors, having siblings vs. not having siblings has a significant influence on physical-motor performance (U=3795.5; p<0.01; d=0.53) and perceptual-motor performance (U=4085.5; p<0.01; d=0.43), with a high and medium effect, respectively. The same situation happens when analyses are performed with the ordinal version (none, one, two, three or more siblings) of the same variables: physical-

motor (H=22.78; p<0.01; d=0.53) and perceptual-motor (H=14.42; p<0.01; d=0.43).

A first general tendency of this influence means that pupils with siblings will have higher scores in the variables of the study where this significant relation has been identified. Regarding how many siblings are needed to observe significant differences (p<0.0125)[1], the comparisons of pairs show that there are evident differences between children with no siblings and children who have one sibling with regards to their physical-motor performance (U=2018.5; p<0.01) and perceptual-motor performance (U=2196.5; p<.01). Therefore, the score of pupils with no siblings (Mdn_{FM}= 100; Mdn_{PM}=65) is lower than the score of the group of pupils with just one sibling (Mdn_{FM}= 110; Mdn_{PM}=70).

On the other hand, the factor "extracurricular physical activities" seems to have no influence on the dichotomous variable version of psychomotor performance (has or has not extracurricular activities), because none of the p values associated to the applied statistic has values lower than 0.05. However, if we analyse this factor based on the different extracurricular activities, we notice an influence on most of the variables under study, with a medium size effect (see Table 3), except for the scores of locomotor skills.

TABLE 3. Influence of the factor "extracurricular activities" on motor performance in ECE

	Mann-Whitney		Kruskal Wallis		
	YES/NO		Type of activity		
	U	*p*	*H*	*p*	*d*
PHYISICAL-MOTOR	2963.5	0.092	10.06	0.039	0.34
PERCEPTUAL-MOTOR	3034	0.136	11.80	0.019	0.39
AFECTIVE-RELATIONAL	3180	0.278	12.791	0.012	0.41

Source: Own elaboration

Specifically, the pairs of categories that show significant differences (p<0.01)[2] are:

(1) Level of significance with Bonferroni correction: 0.0125

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- For physical-motor performance (U=547; p=0.002), perceptual-motor performance (U=517; p=0.001), and affective-relational performance (U=544; p=0.002), between pupils who attend dance classes (Mdn_{FM}=116; Mdn_{PM}=75; Mdn_{AR}=46) and pupils who do not do any activity (Mdn_{FM}=103; Mdn_{PM}=67; Mdn_{AR}=42).
- For the physical-motor variable (U=61; p=0.007), perceptual-motor variable (U=63; p=0.009), and affective-relational variable (U=36.5; p<0.01), between pupils who attend dance classes (Mdn_{FM}=116; Mdn_{PM}=75; Mdn_{AR}=46) and pupils who attend football practices (Mdn_{FM}=116; Mdn_{PM}=67; Mdn_{AR}=102).

Finally, in order to work at a factor level with the overall results of the EMAPI instrument, which measures children motivation to learn, we grouped the original interval variable in three categories. To generate these categories, we took two cut points that segmentate the distribution in three parts of approximately the same size: groups of lowest scores (low level), medium scores (medium level), and highest scores (high level).

Analyses performed show that the motivation factor has a significant influence with a large effect on the physical-motor variable (H=19.88; p<0.01; d=0.6) and perceptual-motor variable (H=18.86; p<0.01; d=0.58), and with a medium effect on the affective-relational performance (H=14.06; p<0.1; d=0.4). When analysing the comparisons of pairs for those variables (see Table 4), we notice that there are significant differences specifically in the group of pupils with a high level of motivation compared to the groups of pupils with a low and medium level of motivation.

TABLE 4. Comparison of pairs with the Mann-Whitney U Test* for the influence of the "motivation to learn" factor on motor performance at ECE

	Low-Medium		Low-High		Medium-High	
	U	*p*	*U*	*p*	*U*	*p*
PHYSICAL-MOTOR	2157.5	0.31	1948	0.000	1253.5	0.011
PERCEPTUAL-MOTOR	2268.5	0.58	2028.5	0.000	1180.5	0.003
AFECTIVE-RELATIONAL	2328	0.76	2235	0.000	1212.5	0.005

Source: Own elaboration
*Level of significance with Bonferroni correction: 0.017

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This influence implies that, as pupils get higher scores in motivation, their scores in psychomotor variables are lower. As an example for physical-motor performance, pupils with a low level of motivation have a higher score (*Mdn*=111) than pupils with a medium level (*Mdn*=106); and, in turn, pupils with a medium level of motivation have a higher score than pupils with higher levels of motivation (*Mdn*=100).

Qualitative results

The content analysis of qualitative information provides 26 subcategories in total, distributed in 4 main categories. Table 5 presents the codes and the percentages of occurrence.

We begin with the *motivation to learn*, the category with the highest weight in the conversations held with teachers of ECE, as they consider motivation to learn the drive that makes children want to learn and improve. One of the teachers defines it as a "process that starts, guides, and maintains behaviours oriented to achieve some goals, passing through certain objectives" (quotation 1:4; MI). They emphasise the responsibility that teachers have to trigger the desire and need of learning in their pupils: "My motivation is making children be interested in all aspects that their life is developing into, above all in the classroom" (quotation 4:1; MI).

100% of participants emphasise that children at ECE are significantly motivated to learn, which positively influences their self-esteem. "At this age, it is strange that a child is not motivated, because they have an innate capacity of imagination, initiative [...]" (quotation 3:3; MI; teacher of 3-year-old children)

Likewise, 64% of participants consider that concentration on, attention to, initiative, and excitement for participating in activities, as well as the ability to connect subject matters and give meaning to what they learn are signs of motivation in children. On the other hand, 27% of participants appreciate, although with a lesser prevalence, some signs of demotivation in children, such as stress, a constant search for external rewards or lack or attention; in short, "they get distracted more often, interrupt more often, and bother other pupils more often" (quotation 2:5; MI-MUDN).

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All participants in the focus group talked about certain factors they consider fundamental to achieve motivation in children: activities with playful character and that include handling, visual and auditory support, novelty, and movement. The statement "all that arises from their bodies is their greatest motivator" (quotation 1:30; MI-FI) was supported by 73% of teachers, who say that children are more responsive and willing to participate in activities with a physical component.

One of the teachers considers this motivation we are discussing as the factor with the greatest influence that she perceives on *academic performance*. This factor is accompanied by the skills and abilities children have and their learning environment, which is advised to be quiet, respectful, and trustful.

When talking about academic performance, a low percentage of participants (18%) consider that their pupils are at a level of development "in process", with special emphasis on the difficulties for linguistic and social-emotional skills in their first years: "They recognise their own emotions and other people's emotions, but they don't regulate them well" (quotation 4:36; RA-CEP-HSE). However, the assessments of teachers characterise most of their pupils as self-sufficient children, who pay attention and have the intention to solve their problems by themselves. In this sense, a teacher of 5-year-old children says: "We talk about mathematics for 5-year-old children at a level that they know tens, can count more than 200, can handle numbers, all of which is well above the average and the minimal requirements for their age" (quotation 5:31; RA-CB-LM). Good performance in these abilities is recorded in the other age ranges too, showing that symbology and handling are well appreciated at ECE.

All teachers state that they are satisfied with the performance of their pupils regarding *psychomotor skills*. Comments and reflections suggest a growing progression as age increases. In the first course (3-year-old children), "they found more difficult to roll, climb, or go up a bench" (quotation 2:36; HM-FM), and also have difficulties to distinguish the concepts of left and right hand. Laterality is not fully consolidated in 4-year-old children either. Postural control is signalled as one of the most deficient aspects at 5, as well as limitations in rhythm and coordination. We must stress out the importance teachers give to the inability of their pupils to relax: "They manage worse in quiet activities" (quotation 6:56; HM).

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"All fields or areas have a great impact in motor skills" (quotation 1:71; HM-ERA), says one of the teachers. The body is seen as a tool that allows to develop other skills. Children at ECE need experiences based on their own body and on handling. Performing daily routines of hygiene and feeding depends highly on psychomotor skills, which also contribute to the respect for rules. In the social and emotional areas, "the shyest children are those who move less and collaborate less in outdoor activities" (quotation 4:50; HM-ERA).

The relation between linguistic and psychomotor levels is justified by the importance of the development of muscles, respiratory skills, and spatial concepts, which are essential for a good reading and writing performance. The main arguments for supporting PA in mathematical learning are spatial-temporal orientation, handling, and laterality: "These are very abstract knowledges; for a knowledge to become abstract, first they have to experience it, as it is the only way children can understand it" (quotation 3:45; HM-ERA).

Although it is true that all participant teachers say several times that there is a relation between psychomotor skills and academic performance, 55% of them exclude some cases: "Each child stands out in a different skill; it is not necessary that they stand out in psychomotor skills to stand out in mathematics". These exceptions occur mostly at the emotional level.

"Before children internalise any learning, they must experience it with their own body" (quotation 3:8; IMI). The importance given to motor skills in early years contrasts with the limited treatment it gets in ECE schools. At best, it is reduced to a single class specifically dedicated to PA per week; however, teachers try to include motor skills as a way to enrich the teaching of other contents.

Finally, with regards to *extracurricular activities*, one of the respondents says that "children that attend extracurricular activities are those who have better coordination; those who are not so developed or have a lesser degree of coordination do not ask their parents to attend to karate or football practice" (quotation 6:62; HM-IAFE). Another teacher adds that "if a child wants to attend one activity, it is because they are motivated, and if you are already motivated, you will handle your psychomotricity better, because that activity motivates you and you want to do it" (quotation 6:64; HM-IAFE). Therefore, they consider that doing

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physical activities outside school helps to improve psychomotor skills, but that improvement already has a solid basis and willingness.

TABLE 5. Categories and subcategories of the qualitative analysis

Categories and subcategories	*Codes*	*Percentage of ocurrence*
. **CHILDREN MOTIVATION**	**MI**	1.60%
1.1. Signs of children motivation	MI-MUMN	13.07%
1.2. Signs of children demotivation	MI-MUDN	2.40%
1.3. Motivational factors	MI-FM	1.33%
1.4. Motivation similar in other areas	MI-SA	2.40%
1.5. Motivation different in other areas	MI-DA	2.93%
1.6. Motivation to PA	MI-AF	1.87%
1.7. Relation between motivation to PA and other areas	MI-AFOA	1.07%
. **ACADEMIC PERFORMANCE**	**RA**	1.07%
2.1. Characteristics of children with good academic performance	RA-CB	2.93%
2.1.1. Autonomy	RA-CB-A	4.00%
2.1.2. Social-emotional skills	RA-CB-HSE	1.33%
2.1.3. Logical-mathematical skills	RA-CB-LM	2.67%
2.1.4. Linguistic skills	RA-CB-L	4.27%
2.2. Characteristics of children with academic performance in process	RA-CEP	1.07%
2.2.1. Autonomy	RA-CEP-A	0.80%
2.2.2. Social-emotional skills	RA-CEP-HSE	4.00%
2.2.3. Linguistic skills	RA-CEP-L	4.53%
2.3. Factors that influence academic performance	RA-FI	4.00%
2.4. Differences due to RAE (Relative Age Effect)	RA-DRAE	0.27%
. **MOTOR SKILLS**	**HM**	12.80%
3.1. Phyisical-motor aspects	HM-FM	1.33%
3.2. Perceptual-motor aspects	HM-PM	2.13%
3.3. Existing relation with other areas	HM-ERA	2.67%
3.4. Non-existing relation with other areas	HM-IRA	2.93%
3.5. Influence of extracurricular physical activities	HM-IAFE	3.20%
. **IMPORTANCE OF MOTOR SKILLS IN EARLY CHILDHOOD EDUCATION**	**IMI**	3.73%
4.1. Treatment of PA in ECE	IMI-TAF	2.13%
4.2. Aspects which should be emphasised more	IMI-AMH	2.13%
4.3. Demands of a greater recognition of the importance of PA	IMI-DMIAF	2.93%

Source: Own elaboration

Discussion

First of all, descriptive results show a high motivation towards school tasks in children 3-6 year old. The work of Jiménez-Hernández and Macotela (2008) supports these results. Those authors recognise that there is an explicit prevalence of motivation in early education pupils and expose the connected complications that arise when they enter Primary School, with an increasing reduction of motivation in 5-year-old children and older. Objective data are supported by the assessments of teachers who, in line with the evidences provided by Pintrich and Schunk (2002), point out that active hearing, the ability to correlate knowledge, and the escalation of knowledge to other contexts are common features of motivated pupils.

The relations estimated by teachers between motivation to learn, self-esteem, and the importance of the role of teachers correspond to the results of other studies (Almagro et al., 2015; Zamarripa, Castillo, Tomás, Tristán, & Álvarez, 2016). They are in line with the work of Ryan and Deci (2000) about the perception of competency as a predictor of a good performance that, in turn, triggers an increase of motivation.

Regarding the influence of motivation on psychomotor performance, statistical analyses demonstrate that this influence is significant on the psychomotor, perceptual-motor, and affective-relational areas. However, we must point out that the conclusions obtained from these relations contradict findings of previous works (Jiménez-Castuera, Moreno, Leyton, & Claver, 2015; Pizani et al., 2016), which observed that children with a higher motivation tend to have a lesser performance in motor aspects, and vice versa. This can be due to the fact that, in this study, the measurement of motivation was carried out by means of a scale that assesses motivation towards school tasks in general, without establishing a distinction between motor and non-motor activities. In the future, we want to complement our results by means of a measurement of motivation specifically focused on PA.

Regarding the second goal of this work, we can conclude that most of the opinions of teachers agree with the correlation that Gil-Madrona et al. (2008) signal regarding social-affective, cognitive, and physical factors. All teachers agree that all areas of ECE must be considered to be interrelated. Their views show that autonomous behaviours are enhanced by motor skills; hygiene and feeding routines and healthy habits are

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considered, again, to have a main role in this (Delgado & Tercedor, 2002). However, the benefits for emotional regulation and social skills are mentioned the least regarding how they depend on psychomotor skills, in spite of the support of authors such as Jiménez-Díaz and Araya (2009) to those benefits.

Teachers also point out that logical-mathematical skills benefit the most from motor skills, confirming the findings of other studies (Gómez-Perancho, 2014; Noguera et al., 2013). Children of these ages learn through what they have at their reach, the body, and spatial-temporal handling and orientation are fundamental to acquire mathematical knowledge. The relation to linguistic skills is confirmed too (Cancela, Ayán, & Sanguos, 2016; Wang et al., 2014), with some qualifications, due to the fact that these skills require a quieter and more attentive attitude that sometimes is scarce in more active children.

The differences between only children and children with one sibling make us think that this factor is a positive influence to enhance psychomotor learning, as stated by Gaviria and Barrientos (2001). A higher number of siblings does not seem to affect the variable significantly, in line with the conclusions of the above authors.

Finally, the answer to a possible relation between psychomotor performance in ECE and attendance to extracurricular physical activities seems to be that this attendance apparently does not impact later psychomotor performance. These results agree with the reduced influence of attendance to extracurricular sport activities in Primary Education found by Carmona et al. (2011). But they differ from the positive influence found in the work of Poblete, Flores, and Bustos (2013). These data are expanded by the argument of teachers that children that ask their parents to attend this type of activities already are proficient in them. These opinions are in line with the findings of other works (Fox, Bar-Anderson, Neumark-Sztainer, and Wall, 2010; Franco et al., 2016), whose results indicate that teenagers with a greater disposition and motivation towards PA are inclined to choose it for their leisure activities. Comparisons between different types of extracurricular activities point out to dance, football, and swimming as the sports that impact the most children performance.

These results are conditioned by the uneven proportion of participants: the number of only children or children with one sibling and the number of children that do not attend extracurricular activities is significantly

higher than the number of children who have more than one sibling and attend extracurricular physical activities. To mitigate these limitations, it would be advisable to have a more homogeneous sample regarding the distribution of these two factors, in order to be able to escalate results more accurately.

Conclusions

After jointly studying psychomotor performance, motivation, and academic performance in other fields, as well as the assessment of the influence of other factors, the following conclusions are reached:

- In any assessment of children performance, motivation must be taken into account as a key factor, given its predominance at early ages. This study agrees with previous arguments in favour of promoting playful, active didactic activities that connect to children's interests. This is a responsibility of teachers who, providing meaningful experiences, must face the challenge of the decrease of motivation of pupils as they grow up. *(Goal 1)*
- The opposing direction of motivation with regards to psychomotor performance in ECE leads us to conclude that children of these ages find in physical activities a way to evade from the monotony or the more conceptual and sedentary character of other school tasks. Psychomotor games have a fundamentally playful, procedural, and delightful character that stimulates children to participate, even if they are not initially motivated to do so. *(Goal 1)*
- The view provided by this research confirms, by means of a qualitative approach, the importance of psychomotor factors as facilitators and enhancers of other acquisitions, extrapolating data found until now about mathematical and linguistic skills to autonomy skills and, to a lesser degree, to social relationships and emotional control. The result is an awareness of the need to integrate psychomotor skills in the teaching of any content to ensure its significance and achieve better results. *(Goal 2)*
- Having one sibling enhances the psychomotor performance of children. On the other hand, attending or not to extracurricular physical activities does not trigger improvements in psychomotor

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performance, but rather it is the type of activities children attend what triggers them. Therefore, we should pay attention to the degree of activity of children in their leisure time and focus more on the type and quality of these activities, instead of focusing on the quantity *(Goal 3)*

These conclusions open future lines of research in order to widen the sample size, pay attention to its homogeneity, and compare the results based on the number of hours devoted to PA and the methodology used for PA, all this aiming to increase the ecological validity and promote the escalation of data with a greater strength and representativity.

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