

Psychomotor development and psychomotor profile of Spanish children between 3 and 6 years

Perfil y desarrollo psicomotor de los niños españoles entre 3 y 6 años

Laura Delgado-Lobete; Rebeca Montes-Montes

Universidade da Coruña

Email: lauradl_91@hotmail.com

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Abstract

Knowing preschooler's psychomotor profile is required in order to design educative and therapeutic strategies that covers the population's needs. The aim of this study was to know the psychomotor profile of Spanish preschool children. We carried an observational study with 217 preschool children (mean age=4,15 years; 52,8% were girls). EOD-B was used to evaluated psychomotor development profile. Results showed a mean of 81,8% of age-expected psychomotor development. Prevalence of psychomotor retardation within the sample was 4%. Psychomotor areas with more retardation were affectivity (15,6%), manual motricity (10,6%), and gross motricity (7,3%). Girls showed better psychomotor development and a lower psychomotor retardation prevalence than boys ($p<0,01$; $p<0,05$). Girls also showed less retardation on manual motricity and cognitive abilities than boys ($p<0,01$; $p<0,05$). This study offers new evidence of Spanish preschool children psychomotor development characteristics. Implications and new educative and therapeutic actuation lines are discussed.

Keywords

Psychomotor development; psychology of movement; psychomotor retardation; child development.

Resumen

Conocer las características psicomotoras de la población infantil, es esencial para elaborar estrategias adecuadas de intervención educativa y terapéutica, ajustadas a las necesidades de los niños. El objetivo de este estudio fue conocer el perfil y desarrollo psicomotor de los niños españoles de 3 a 6 años. Se llevó a cabo un estudio observacional descriptivo-analítico, en el que participaron 217 niños (edad media=4,15 años; 52,8% niñas). El perfil del desarrollo psicomotor se evaluó mediante la Escala Observacional del Desarrollo-versión breve (EOD-B). Los resultados revelaron una media de desarrollo psicomotor del 81,6% del desarrollo esperado para la edad cronológica, y una prevalencia de retraso psicomotor del 4%. Los rasgos psicomotores con mayor dificultad de desarrollo en la muestra fueron la afectividad (15,6%), la motricidad manual (10,6%) y la motricidad somática (7,3%). Las niñas mostraron menor prevalencia de retraso psicomotor y un desarrollo psicomotor significativamente superior a los niños ($p<0,05$; $p<0,01$), así como un desarrollo significativamente superior en motricidad manual y concepción-pensamiento ($p<0,01$; $p<0,05$). Este estudio aporta nuevas evidencias sobre el perfil psicomotor de los niños españoles en edad preescolar y propone nuevas líneas de actuación educativa y terapéutica.

Palabras clave

Desarrollo psicomotor; psicología del movimiento; retraso psicomotor; desarrollo infantil.

Introduction

Psychomotor development refers to the interrelationship between internal factors -i.e. Central Nervous System maturation- and external or relational factors -i.e. stimulation, learning, socioeconomic factors- (Cobos Álvarez, 2007). Fundamental motor skills acquisition and development occurs during the first six years of the child's life, while motor improvement and perfecting are expected to occur through engagement in activities of daily living from this age onwards (Bardid, Deconinck, Descamps et al., 2013). A good psychomotor development since early childhood will influence children holistic and integral development, as well as their occupational performance (Blank, Smits-Engelsman, Polatajko & Wilson, 2014; Magalhães, Cardoso & Missiuna, 2011). Children with psychomotor development difficulties experience severe difficulties during their occupational performance, especially in those activities characteristic of the preschool stage, such as play and sports activities, social participation and school performance (King-Dowling, Missiuna, Rodriguez,

Greenway & Cairney, 2015; Magalhães, Cardoso & Missiuna, 2011; Prunty, Barnett, Wilmot & Plumb, 2014).

Relevance of psychomotor stimulation in young children has promoted the design and implementation of educational and therapeutic strategies to ensure correct psychomotor development since early ages (Federación Estatal de Asociaciones de Profesionales de Atención Temprana, 2005; Ley Orgánica 2/2006, 2006). Spanish educational system gives great importance to perceptual-motor, emotional and social development during preschool years (Orden ECI/3960/2007, 2007). Despite not including a specific area of Psychomotricity in the Spanish national education plan for preschool years, Spanish regulation points out the significance of motor, emotional and social stimulation in scholar context. However, studies suggest that measures taken by schools to promote motor stimulation are not effective enough (Pons Rodríguez & Arufe Giráldez, 2016). On the other hand, health professionals have recognized the need to include psychomotor stimulation within early attention programs for children under six years at risk (Ley 39/2006, 2006; Resolución de 3 de agosto de 2011, 2011).

The strategies implemented to promote psychomotor stimulation underline the need to design both the scholar and therapeutic lines of action toward the real needs of the children under six since they are the main focus of early attention and preschool resources (Federación Estatal de Asociaciones de Profesionales de Atención Temprana, 2005). To achieve this, we need to carry out observational studies to describe the psychomotor development profile of children, including the exploration of the different psychomotor areas. Regarding this aspect, national and international studies have investigated different aspects of psychomotor development, including the prevalence of different psychomotor disorders and comorbidities (Cermak et al., 2015; Delgado, Montes & Prieto, 2016; Delgado & Montes, 2017; Saraiva, Rodrigues, Cordovil & Barreiros, 2013). However, few studies have explored psychomotor profile in preschool children, especially in Spanish children.

This study examines the psychomotor development profile of Spanish children between three and six years, and explores the association between individual psychomotor areas and global psychomotor development.

Material and methods

Design

Observational and analytical prevalence study.

Participants and inclusion criteria

Six preschool schools situated in three Spanish northern cities were selected. Parents of 218 children between three and six years attending these schools were recruited (mean children age=4,15 years; 47,2% were boys). Parents were assessed with the EOD-B (Secadas, 2009) to evaluate their children psychomotor development. Assuming psychomotor development variance of 132 (Delgado & Montes, 2017), this sample size is strong enough to estimate psychomotor development profile with 99% of security ($\alpha=0,01$) and 2% of precision. Children with previous conditions or developmental disorders were not including in the study.

Variables and measurements

Children sex, year and psychomotor development were included as main variables of study.

Children psychomotor development profile was assessed with the Development Observational Scale-Brief version (EOD-B; Secadas, 2009). EOD-B is a parent questionnaire with good psychometric quality in Spanish children and has been previously used in similar samples (Delgado, Montes & Prieto, 2016; Delgado & Montes, 2017). This scale assesses the psychomotor development achieved by each child in comparison to the expected development for their age. It covers eight psychomotor areas, including affectivity, somatic-motricity, sense-motricity, manual-motricity, perceptive-motricity, communication, conceptualization-thought and normativity. Since normativity area is only evaluable in children older than five years, we did not include this area in the study analysis.

Scores per each area and global score represents the child level of psychomotor development in comparison to age expected development. Scores below 50% in each psychomotor area are classed as being at risk of the specific area while global scores below two standard deviations below the mean are classed as being at risk of a psychomotor retardation.

Statistical analysis

We conducted descriptive and inferential analysis using IBM SPSS v. 20. Age and psychomotor development scores, both global and specific for each area, were expressed through mean (X) and standard deviation (SD) while sex and psychomotor retardation were expressed through relative and absolute values. Sample data normality was examined with Kolmogorov-Smirnov test and Levene test. Association between qualitative variables were investigated with Pearson Chi Square (X^2). Additionally, association between psychomotor development and sex, age, and specific area retardations were investigated with Student's T test or ANOVA test. Values of $p \leq 0.05$ were considered statistically significant.

Ethics

We applied universal ethical requirements of clinical research (Emanuel, Wendler & Grady, 2000) and all applicable legal requirements in non-invasive observational studies. Participants agreed to sign their voluntary, free and informed consent to participate in the study. We made data anonymous by removing any confidential or personal data of participants to warrant confidentiality.

Results

Descriptive analysis

Sample mean psychomotor development was 81.6% in comparison to their age expected development ($SD=10.6$). Scores below 60% were classed as being at risk of a psychomotor retardation. We found that the prevalence of psychomotor retardation in the sample was 4.1%.

Table 1 shows the psychomotor areas assessed in the sample study. Affectivity, manual-motricity and somatic-motricity were the most affected areas, with a prevalence of retardation between 7.3-15.6%.

Table 1. Psychomotor areas assessed

Psychomotor area	Typical development	Delay
	N (%)	N (%)
Affectivity	184 (84.4)	34 (15.6)
Somatic-motricity	202 (92.7)	16 (7.3)
Sense-motricity	217 (99.5)	1 (0.5)
Manual-motricity	195 (89.4)	23 (10.6)
Perceptive-motricity	214 (98.2)	4 (1.8)
Communication	213 (97.7)	5 (2.3)
Conceptualization-thought	213 (97.7)	5 (2.3)

Inferential analysis

The associations between specific psychomotor area retardation and psychomotor development are reported in Table 2. Children with affectivity retardation, somatic-motricity retardation, manual-motricity retardation, perceptive-motricity retardation, communication retardation or conceptualization-thought retardation have a significant lower grade of psychomotor development ($p < 0.01$).

Table 2. Psychomotor development according to the specific psychomotor areas

Affectivity			
	Typical development (n=184) X ± DT	Delay (n=34) X ± DT	t-test
Psychomotor development	83.00 ± 9.63	74.34 ± 12.74	4.56***
Somatic-motricity			
	Typical development (n=202) X ± DT	Delay (n=16) X ± DT	t-test
Psychomotor development	82.73 ± 9.55	68.07 ± 14.09	5.68***
Sense-motricity			
	Typical development (n=217) X ± DT	Delay (n=1) X ± DT	t-test
Psychomotor development	81.68 ± 10.64	76.00 ± 0.00	0.53
Manual-motricity			
	Typical development (n=195) X ± DT	Delay (n=23) X ± DT	t-test
Psychomotor development	82.90 ± 9.53	71.08 ± 13.47	5.36***
Perceptive-motricity			
	Typical development (n=214) X ± DT	Delay (n=4) X ± DT	t-test
Psychomotor development	82.03 ± 10.29	61.22 ± 8.22	4.02***
Communication			
	Typical development (n=213) X ± DT	Delay (n=5) X ± DT	t-test
Psychomotor development	81.95 ± 10.47	69.18 ± 10.53	2.69**
Conceptualization-thought			
	Typical development (n=213) X ± DT	Delay (n=5) X ± DT	t-test
Psychomotor development	82.16 ± 10.12	60.06 ± 9.68	4.83***

=very significant $p < 0,01$; *=extremely significant $p < 0,001$

We also analyse differences in psychomotor profile according to sex (Table 3 and Table 4). Girls showed less prevalence of psychomotor retardation, manual-motricity retardation and conceptualization-thought retardation ($p<0.05$; $p<0.01$; $p<0.05$), as well as better global psychomotor development ($p<0.05$).

Table 3. Psychomotor delay and specific psychomotor areas delay according to sex

	Boys (n=103) N (%)	Girls (n=115) N (%)	X²
Psychomotor delay	8 (7.77)	1 (0.87)	6.53*
Specific psychomotor areas delay			
Affectivity	20 (19.42)	14 (12.17)	2.16
Somatic-motricity	8 (7.77)	8 (6.96)	0.52
Sense-motricity	1 (0.97)	0 (0)	1.12
Manual-motricity	17 (16.50)	6 (5.22)	7.33**
Perceptive-motricity	4 (3.88)	1 (0.87)	2.20
Communication	4 (3.88)	1 (0.87)	2.20
Conceptualization-thought	5 (4.85)	0 (0)	5.71*

*=significant $p<0,05$; **=very significant $p<0,01$

Table 4. Psychomotor development according to sex

	Boys (n=103) X ± DT	Girls (n=115) X ± DT	t-test
Psychomotor development	79.17 ± 11.75	83.88 ± 8.98	3.35***

***=extremely significant $p<0,001$

Lastly, we analysed influence of age on psychomotor development with ANOVA (Table 5). We found that older children had lower psychomotor development compared to age expected development than younger children.

Table 5. Psychomotor development according to age

	3 years	4 years	5 years	6 years	
	(n=72)	(n=53)	(n=80)	(n=12)	F
	X ± DT	X ± DT	X ± DT	X ± DT	
Psychomotor development	83.30 ± 9.12	85.18 ± 9.27	79.04 ± 10.54	81.79 ± 10.45	5.77**

**=very significant $p < 0,01$

Discussion

Sample's mean psychomotor development was 80% in comparison to age expected development, which is consistent with previous research (Delgado & Montes, 2017), while psychomotor retardation affected 4% of children studied. This finding is similar to other international studies that have found a prevalence of Developmental Coordination Disorder of 5-6% (Blank et al., 2014).

Somatic-motricity retardation and manual-motricity retardation were the most prevalent motor conditions in the sample and affected 7.3% and 10.6% of children respectively. Fundamental motor skills, including corporal space movement and object manipulation and control skills are the necessary previous step in the development of more complex motor skills, such as global dynamic coordination (Bardid et al., 2013). We found that children with somatic-motricity or manual-motricity retardation showed a significant lower psychomotor development than their somatic-motricity or manual-motricity typically developing peers. Fundamental motor skills do not spontaneously improve or develop but must be trained through different motor patterns activities from early ages since children need to master their fundamental motor skills by the age of seven to satisfy the demands of their age expected occupations and activities (Bardid et al., 2013). Moreover, fine-motricity difficulties are a common problem within children with Developmental Coordination Disorder and limit their academic performance (Huau, Velay & Jover, 2015; Prunty, Barnett, Wilmut & Plumb, 2014). Thus, fundamental motor skills acquisition and development difficulties can lead to a developmental disorder that will influence not just early ages, but scholar and adolescent ages. Children need to engage in several and varied motor and perceptual opportunities to promote motor learning (Haywood, Robertson & Getchell, 2012; Magill, 2011; Shumway-Cook & Woollacott, 2010), and we consider schools can offer good

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opportunities for children through programs that use directives-functional psychomotor activities, that are specifically designed for specific psychomotor goals, since these approaches have demonstrated to have a positive influence on children's motor development (Palma, 2008; Teixeira Costa, Abelaires-Gomez, Arufe-Giráldez, Pazos Couto & Barcala-Furelos, 2015; Terry Andrés, 2014).

Regarding specific psychomotor areas, we found a prevalence of affectivity difficulty of 15.6%. Previous research has found that children with psychomotor and coordination disorder show poor social skills (Armstrong, Redman-Bentley & Wardell, 2013), challenged behaviour (King-Dowling et al., 2015) and more prevalence of anxiety, social phobia and depression and lower self-esteem than their typically developing peers (Pratt & Hill, 2011; Piek, Barrett, Smith, Rigoli & Gasson, 2010). These findings highlight that psychomotor interventions, both educational and therapeutic, cannot neglect the affective and social needs of children with psychomotor or coordination disorders and must include affective and social stimulation as a fundamental part of intervention programs.

Additionally, we found that communication retardation and conceptualization-thought retardation were associated with lower psychomotor development. Previous studies have found that Developmental Coordination Disorder prevalence is five times higher in children with communication or speech disorders (Flapper & Schoemaker, 2013; Gaines & Missiuna, 2007). Gross and fine motor difficulties tend to associate with speech disorders, especially with receptive and expressive communication and auditory comprehension (Flapper & Schoemaker, 2013; King-Dowling et al., 2015), so these findings suggest that communication-speech disorders can be associated with phonetic-motricity psychomotor disorders. Regarding conceptualization-thought difficulties, previous research has pointed out that gross motor development in children can be an important predictor of later academic performance and cognitive development (Piek, Dawson, Smith & Gasson, 2008).

In our sample, older children showed a lower psychomotor profile than their younger peers', despite most of studies have found that psychomotor development improves with age, not just because of Nervous System maturation but because older children have more opportunities of motor experimentation (Cueto, Prieto, Nistal, Abelairas-Gómez, Barcala-Furelos & López, 2017). This study results can be explained because of the heterogeneous age and sex distribution in sample, which makes comparisons between age groups difficult.

This study highlights the fundamental role of psychomotor development to achieve developmental milestones. Psychomotor stimulation and psychomotor rehabilitation need to gain importance in educational and therapeutic programs and must be performed by professionals. Spain has not yet developed a psychomotricity formal education, so psychomotricity training is conducted in postgrad programs without consensual schedule, while some official grade programs include some psychomotricity training, such as Bachelor of Education or Bachelor of Occupational Therapy programs (Pons Rodríguez & Arufe Giráldez, 2016). Due to the importance of the approach used in psychomotor intervention, it is urgent that Spain legally regulates the training and practice of psychomotor professional in educational and therapeutic fields.

Despite psychomotor stimulation has a prominent role in Preschool Education programs, most of times the resources and school time dedicated to psychomotor intervention are not sufficient enough. Galician schools dedicate a mean of 40 minutes per week to psychomotor interaction (Pons Rodríguez & Arufe Giráldez, 2016), and this amount of time cannot have a significant positive impact of child's development. Children need to get psychomotor stimulation sufficient enough to successfully achieve preschool and school academic goals. Children with psychomotor difficulties tend to find more challenges in school, especially in maths and spatial organization (Blank et al., 2014; Magalhães, Cardoso & Missiuna, 2011; Prunty, Barnett, Wilmut & Plumb, 2014). This situation is particularly worrying given motor development difficulties tend to grow during school age and adolescence (Barnett, van Beurden, Morgan, Brooks, & Beard, 2010; King-Dowling et al., 2015). Our study shows a high prevalence of fine and gross motor difficulties, which additionally are the psychomotor areas that associate the most with global psychomotor development. In our opinion, these findings highlight the need for strengthened psychomotor programs led by neuromotor trained professionals, based on a directive-functional psychomotor approach to intervene on the most compromised psychomotor areas.

Conclusions

Psychomotor development profile of Spanish children between three and six years reached approximately 80% of age expected development, with a prevalence of psychomotor retardation of 4%. Somatic-motricity and manual-motricity were the most affected

psychomotor areas, and the areas that showed greater association with global psychomotor development, which points out the importance of approach the psychomotor development as an integral and holistic process. Sex associates with psychomotor profile in children under six years, and boys have more prevalence of psychomotor retardation than girls. Younger children showed better psychomotor development than their older peers; however, this particular finding cannot be generalized due to sample and study characteristics.

The present study provides novel data regarding Spanish preschoolers psychomotor development based on a broad sample, and shows the associations between psychomotor development and the specific psychomotor areas. The high prevalence of somatic-motricity and manual-motricity retardation justify the need to strengthen psychomotor stimulation since scholar context. It is necessary to legally regulate the training and professionalisation of the psychomotor intervention in Spain, focusing on its two main specializations: scholar psychomotor practice and therapeutic psychomotor practice.

Limitations and future lines

Despite we consider the main purposes of the study are fulfilled, some minor limitations must be considered as well when interpreting the results of this study and suggest some recommendations for future investigations. Prevalence of psychomotor retardation is based on sample distribution of the children daily performance as reported by parents, and although this is a valid method to evaluate the psychomotor development (Blank et al., 2014), it would be advisable to complement these findings with clinical evaluation. Lastly, this study only assesses the psychomotor development in children between three and six years whose age distribution was not homogenic, so future studies should explore motor development in older children with homogenic age distribution. Future studies should include variables not contemplated in this investigation that may influence psychomotor development, such as inattention/hyperactivity or socioeconomic family status.

Conflicts of Interest Statement

The authors certify that they have no conflicts of financial or non-financial interest.

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