Original Article

Analysis of the psychomotor profile, learning difficulty and emotional level in preschoolers

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ABSTRACT

The study of emotions, learning and psychomotor profile is currently under development, but it has not been very numerous in preschool-age populations. Based on this, this work is proposed with the objectives of analysing emotional intelligence and psychomotor characteristics of a school population of children under 5 years old and establishing the relationships between psychomotor and intelligence parameters with sociodemographic variables. Sixty-two pre-schoolers between the ages of two and three (2.78 ± 0.42 years) in the city of Riobamba in Ecuador participated in this non-experimental, descriptive, cross-sectional study. They were administered the psychomotor battery (BMP) by Da Fonseca (1975), and the EKAT (Emotion Knowledge and Awareness Test) adapted to the child population by Rossi (2016). The results showed that most of the participants presented a normal psychomotor profile and had no learning difficulties, while the faces generated greater knowledge in which they looked annoyed and surprised. Work of this type promotes knowledge at a physical and cognitive level of elements that affect schoolchildren and that could have repercussions at a later age.

Keywords: Motor ability; Childhood; Emotional intelligence; Development.

Cite this article as:
Avalos, M., Zurita, F., & Cachón, J. (2022). Analysis of the psychomotor profile, learning difficulty and emotional level in preschoolers. *Journal of Human Sport and Exercise*, *17*(2), 389-399. https://doi.org/10.14198/jhse.2022.172.14

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Submitted for publication July 06, 2020.
Accepted for publication September 11, 2020.
Published April 01, 2022 *(in press* October 21, 2020).
JOURNAL OF HUMAN SPORT & EXERCISE ISSN 1988-5202

doi:10.14198/jhse.2022.172.14

INTRODUCTION

A growing interest in the study of the emotional development of children in early life and the elements that influence it is described (Black et al, 2017). In this regard, Anderson et al. 2003) emphasizes that the comprehensive development of the infant is closely related to social elements and family nature that have a direct impact on the child's state of health, language, cognition, and social and emotional interaction.

Emotional and social development in children has been conceptualized as the ability of the infant to establish relationships with peers and adults; as well as the possibility of experiencing, regulating and expressing emotions in socially and culturally appropriate ways (Darling and Lippman, 2016). Children's emotional intelligence presents uniquely integrative and psychologically constructive characteristics, manifesting itself in processes of perception, emotional understanding, the growth of self-awareness and self-understanding of their emotions and others (Thompson, 2015).

These characteristics have been identified as the main reason for increasing research to determine the development of emotional intelligence in children under 5 and the causes that influence it (Fernández-Martínez and Montero García, 2016; Guil, Mestre, Gil Olarte, De la Torre, and Zayas, 2018; Guzmán, 2018). It is understood that an adequate emotional development in early life favours children's development by encouraging a better process of adaptation to the environment that surrounds them based on an adequate interpretation of the surrounding phenomena (Darling and Lippman, 2016).

There is evidence about the capacity to exercise the cognitive area of the human being, and that is why the possibility of training emotional competence through didactic and interactive programs has been raised (Mattingly, and Kraiger, 2019); also described is the possibility of establishing parameters for the application of reliable schemes so that advances in the emotional area can be assessed with the help of neuroscientific models (Smith, William, Killgore, Alkozei, and Lane, 2018).

Similarly, various tests or parameters are established to evaluate emotional capacity based on the determination of indicators associated with physiological responses that include changes in basal heart rate and/or blood pressure (Zysberg and Raz, 2019). In the case of infants, the use of the Emotion Knowledge and Awareness Test is described, characterized by the recognition of emotions inexpressive faces and the external and internal causes that produce them (Voltmer and Salisch, 2017). This test allows us to assess emotional awareness and self-regulation as a social component (Garner, and Waajid, 2012), thus showing the close relationship between children's emotional competence and future academic success (Rhoades, Warren, Domitrovich and Greenberg, 2011).

In pre-school age, psychomotor development is an essential aspect, if we take into account that intelligence is the result of the motor activity during the formation process in the first years of life. The execution of actions constitutes the pivot in the assimilation of knowledge, in the learning on which the education and integral development of the child is built (Leiva and Valdés, 2016). As a result of the child's interaction with the adult, changes in motor development occur, movements become voluntary and at the end of their second year of life they acquire greater coordination and control, being able to maintain the bipedal position during walking. In this way, he ensures mastery of the body, which becomes more restless and incorporates new actions and motor skills in interaction with the environment as part of his learning.

In terms of exploring the world around them, children not only achieve motor development, but also cognitive processes, develop sensory perception, language, and the ability to think and reason. In the emotional

affective they develop feelings and learn to control them. They can express a variety of emotions in response to certain influences as they learn to manage them. These emotions are expressed through motor manifestations such as facial movements or other actions involving the movement of various muscles in the body (Benavides and Gavilanes, 2017). In Ecuador, there are few studies aimed at determining emotional intelligence and motor conditions in children under the age of 5, specifically in the province of Chimborazo and in the city of Riobamba where this research is focused. Therefore, taking into account the importance of determining emotional intelligence in children under the age of 5, as well as the causes that influence it, it was decided to carry out this research with the objectives of a) analysing emotional intelligence and psychomotor characteristics of a school population of children under the age of 5 and b) establishing the relationships between psychomotor and intelligence parameters with sociodemographic variables.

MATERIAL AND METHODS

Design and Participants

Sixty-nine pre-schoolers aged 2-3 (2.78 ± 0.42 years) in the city of Riobamba in Ecuador participated in this non-experimental, descriptive, cross-sectional study. Participants responded and performed the various tests voluntarily and with the informed consent of their legal representatives. Seven (7) pre-schoolers were excluded, due to not meeting the inclusion criteria (i.e. poorly completed tests or no permission from legal representatives). The final sample was composed of sixty-two (62) subjects (38 girls and 24 boys).

Instruments

The first instrument used was a socio-economic data collection sheet, where pre-schoolers or their legal representatives were asked about family (type of family, number of siblings), economic (parents' employment status) or social aspects (ethnic group).

The second instrument used was Da Fonseca's psychomotor battery (BMP) (1975), which is an observation instrument that detects and identifies school children who do not have the psychomotor skills necessary for their learning and development (Segers et al, 2018). The BMP consists of 7 psychomotor factors (tonicity, balance, laterality, the notion of the body, spatial-temporal structure, global praxis, and fine praxis), and is subdivided into 26 sub-factors, with the average score of each factor being obtained (which is in the range of 1 to 4). The BMP assesses a numerical result that determines 5 types of psychomotor profile: superior (27-28 points), good (22-26 points), normal (14-21 points), dyspractical (9-13 points) and deficient (7-8 points) and 3 types of learning difficulties: not difficult (14-28 points), mild difficulty (9-13 points) and significant difficulty (7-8 points).

The third instrument used was the EKAT (Emotion Knowledge and Awareness Test) adapted to the child population by Rossi (2016), which is a scale of 36 items. In its first 6 items, they analyse how they feel using means of a scale of faces, while in the remaining 30 items employing means of an observation scale, average scores are determined concerning respect to the basic emotions that are innate in human beings (joy, anger, disgust, surprise, sadness, fear and mixed).

Procedure

First, the study was approved by the ethics committee of the corresponding university under code & quote; 641/CEIH/2018. The researchers were then instructed on how to evaluate the different tests so that this would be done in a consensual and objective manner and that no errors in observation would be found. To this end, five children from another area of Ecuador were recorded in the pilot study, with the conclusion that they could not be part of the study and thus have no prior information from the tests that could be memorized.

The recordings were viewed individually and when uniformity was reached in the responses (90%), the team was considered ready to carry out the measurement. The data was collected during school hours and for approximately one hour in groups of 4 pre-schoolers in order not to miss many classes.

Statistical analysis

In this study, the statistical package SPSS 24.0 was used to analyse the basic descriptors, contingency tables, T-Students, and ANOVA, for Windows, also for the normality test Kolgomorov Smirnov's test was used to give the correct data. To confirm the suitability of the instruments, the Cronbach reliability test was carried out, obtaining values of over 0.700 in all the instruments.

Table 1. Study descriptions.

	N	%		N	%
Sex			**Work performance represented**		
Female	38	61.3%	Agriculture	9	14.5%
Male	24	38.7%	Livestock	18	29.0%
Family			Domestic	24	38.7%
Nuclear	24	38.7%	Other	11	17.7%
Extended	25	40.3%	**Academic training**		
Single Parent	13	21.0%	None	2	3.2%
Number of siblings			Basic School	27	43.5%
One	40	64.5%	High School	25	40.3%
Two	22	35.5%	Higher	8	12.9%

Table 2. Study descriptors.

	N	%		N	%
Psychomotor profile			**Learning**		
Normal	59	95.2%	No difficult	59	95.2%
Dyspraxic	3	4.8%	Slight Difficulty	3	4.8%
Identification of emotions faces					
Which face looks happy	M = 1.00	DE = 0.00	Which face looks upset	M = 2.08	DE = 0.274
Which face looks sad	M = 2.00	DE = 0.00	Which face looks scared	M = 1.12	DE = 0.461
Which face looks upset	M = 3.00	DE = 0.00	Which face looks surprised	M = 2.80	DE = 0.567

RESULTS

In terms of basic descriptive data, girls (61.3%) outnumbered boys (38.7%). In terms of family, nuclear and extended families were the most numerous with figures close to 40%, while single-parent families were the least frequent (21%). The number of siblings ranged from one (64.5%) to two (35.5%), as far as work performance was concerned most of them were engaged in domestic tasks (38.7%), while farmers were the least represented (14.5%), finally, most of the student representatives had basic (43.5%) or high school studies (40.3%).

The psychomotor profile of the infant students dictated that most of the participants presented a normal psychomotor profile (95.2%) and did not have learning difficulties (95.2%). As for the faces of the EKAT, the values found showed a greater knowledge in the face that looks annoyed (M = 3.00) followed by the surprised face (M = 2.80), on the contrary, the faces that look happy or scared are the least scored with values close to 1.

About the correspondences, it should be indicated that no statistically significant differences were found between the sociodemographic parameters (gender, work performance, type of family and number of siblings) and the psychomotor and learning variables ($p \geq .050$), as reflected in the following table; but differences were found between ($p = .012$) academic training and the psychomotor and learning profile provided by those participants who have no training and whose children are on an equal footing between no learning difficulty and slight difficulty, as well as a normal and dyspractical psychomotor profile (50% in all cases), although it should be indicated that the small number of participants in these categories could lead to confusion of the data.

Regarding the identification of the emotions of the faces with the socio-demographic variables and taking into account that all the participants correctly indicated the happy, sad and angry face, the results showed that no statistically significant differences were established ($p \geq .050$) between the identification of faces with the number of siblings, training and work performance. If the statistical association was found in the scared face and gender ($p = .005$) caused because boys score it higher than girls ($M = 1.33$ versus $M = 1.00$), in the case of the surprised face it is higher in girls ($M = 3.00$) than in boys ($M = 2.50$).

Finally, in which face is more frightened, there are differences in the case of families ($p = .009$), caused by school children from single-parent families ($M = 1.48$) greater than the other typologies; they were also found in psychomotor profile ($p = .037$), where dysplastic school children score higher ($M = 1.66$) than normal ones ($M = 1.10$).

Table 3. Relationship between psychomotor profile, learning difficulty and socio-demographic parameters Psychomotor profile.

	Psychomotor profile		**Sig.**	**Learning**		**Sig.**
	Normal	**Dyspraxic**		**No difficulty**	**Slight Difficulty**	
Gender						
Female	36 (94.7%)	2 (5.3%)	.845	36 (94.7%)	2 (5.3%)	.845
Male	23 (95.8%)	1 (4.2%)		23 (95.8%)	1 (4.2%)	
Labour performance						
Agriculture	9 (100.0%)	0 (0.0%)	.486	9 (100.0%)	0 (0.0%)	.486
Livestock	18 (100.0%)	0 (0.0%)		18 (100.0%)	0 (0.0%)	
Domestic	22 (91.7%)	2 (9.3%)		22 (91.7%)	2 (9.3%)	
Other	10 (90.9%)	1 (9.1%)		10 (90.9%)	1 (9.1%)	
Type of family						
Nuclear	24 (100.0%)	0 (0.0%)	.111	24 (100.0%)	0 (0.0%)	.111
Extended	24 (96.0%)	1 (4.0%)		24 (96.0%)	1 (4.0%)	
Single Parent	11 (84.6%)	2 (15.4%)		11 (84.6%)	2 (15.4%)	
Number of siblings						
One	37 (92.5%)	3 (7.5%)	.188	37 (92.5%)	3 (7.5%)	
Two	22 (100.0%)	0 (0.0%)		22 (100.0%)	0 (0.0%)	
Academic training						
None	1 (50.0%)	1 (50.0%)	.012	1 (50.0%)	1 (50.0%)	.012
Basic School	25 (92.6%)	2 (7.4%)		25 (92.6%)	2 (7.4%)	
High School	25 (100.0%)	0 (0.0%)		25 (100.0%)	0 (0.0%)	
Higher	8 (100.0%)	0 (0.0%)		8 (100.0%)	0 (0.0%)	

Table 4. Relationship between face identification with socio-demographic parameters.

Identification Faces		M	D.E	Sig.		M	D.E	Sig.
Gender					**Number of Siblings**			
Which face looks upset	Female	2.02	0.162	.049	One	2.12	0.334	.086
	Male	2.16	0.380		Two	2.00	0.000	
Which face looks scared	Female	1.00	0.000	.005	One	1.20	0.563	.103
	Male	1.33	0.701		Two	1.00	0.000	
Which face looks surprised	Female	3.00	0.000	.000	One	2.75	0.630	.295
	Male	2.50	0.834		Two	2.90	0.426	
Performance					**Training**			
Which face looks upset	Agriculture	2.11	0.333	.966	None	2.00	0.000	.675
	Livestock	2.05	0.235		Basic School	2.03	0.192	
	Livestock	2.08	0.282		High School	2.12	0.331	
	Other	2.09	0.301		Higher	2.12	0.353	
Which face looks scared	Agricultura	1.00	0.000	.275	None	1.00	0.000	.292
	Livestock	1.00	0.000		Basic School	1.22	0.577	
	Livestock	1.25	0.607		High School	1.00	0.000	
	Other	1.18	0.603		Higher	1.25	0.707	
Which face looks surprised	Agricultura	2.66	0.707	.346	None	3.00	0.000	.890
	Livestock	2.66	0.766		Basic School	2.85	0.456	
	Livestock	2.95	0.204		High School	2.76	0.663	
	Other	2.81	0.603		Higher	2.75	0.707	
Family					**Psychomotor Profile**			
Which face looks upset	Nuclear	2.16	0.380	.103	Normal	2.08	.280	.606
	Extended	2.00	0.000		Dyspraxic	2.00	.000	
	Single Parent	2.07	0.277					
Which face looks scared	Nuclear	1.08	0.408	.009	Normal	1.10	.402	.037
	Extended	1.00	0.000		Dyspraxic	1.66	1.154	
	Single Parent	1.46	0.776					
Which face looks surprised	Nuclear	2.83	0.564	.871	Normal	2.79	.580	.550
	Extended	2.76	0.663		Dyspraxic	3.00	.000	
	Single Parent	2.84	0.375					

DISCUSSION

The study presented here is comparable to other studies developed around the world with populations similar to the one analysed, such as those reported by various scientists (Rubio, García, and Cervantes, 2012; Gariboti et al, 2013; Osorio et al, 2017; Gutiérrez et al, 2017). To carry out this type of study is presented as a priority, if we take into account the significance that psychomotor development, learning, experiences, and socialization have in this stage of life through the interaction with the environment in the acquisition of new knowledge and learning and, therefore, in the integral development of the subject, favoured by the development of the nervous system, particularly the brain and its plasticity in these years.

It is during this period that children develop the social, behavioural and academic skills essential for education and success in school, and it is the time when they learn to focus their attention, interact and share with their peers (Marín Méndez, Borra Ruiz, Álvarez Gómez, and Soutullo Esperón, 2017).

As far as the family is concerned, nuclear and extended families are the most numerous, while single-parent families are the least frequent. In this sense, research carried out by Osorio, Cortés, Herrera, and Orozco (2017) and Sierra and Rincón (2019) show similar results. The economic and social changes of recent years have impacted on family composition and structure with significant changes.

In the present study, although no significant differences were observed in the children included in the different types of families, the totality of those belonging to nuclear families showed a normal psychomotor profile, which may be due to the role played by both parents in the care and education of their children and the importance of family stimulation in child development. On the other hand, it is pointed out that phenomena such as the information society, the development of networks and media, the culture of violence and competitiveness in society, influence these trends in the development of families (Martínez, Infante and Medina, 2016).

As for the number of siblings, with a predominance of one, followed by two, it coincides with the reports given by Sierra and Rincón (2019); Osorio, et al. (2017), as a consequence of the social development itself, of the changes in the current trends, at a global level, there has been a decrease in the number of families with a high number of children, a condition that could facilitate the attention of parents to children of these ages and promote their development. As far as work performance is concerned, most of them were engaged in domestic tasks while farmers were the least represented, work activities in which they do not receive high income and, therefore, the socioeconomic level tends to be medium or low, this aspect not marking significant differences, however, two of the dyspractical children live with domestic workers.

In this sense, authors such as Valdés and Spencer (2011) establish a direct positive relationship between socioeconomic level and psychomotor development. In this regard, Alcántara (2017) and Rivadeneira (2016) report that low socioeconomic status is a risk factor for delayed psychomotor development since it affects living conditions that affect family functioning, communication, care and education of children.

On the other hand, most of the student representatives had basic or high school studies. Similar results are presented in the literature (Gariboti, 2013; Osorio, Cortés, Herrera, and Orozco, 2017; Segers et al, 2018), arguing some households with less presence of parents with a university education, an aspect that could become a limitation for the development of children, evidenced in this study. To the extent that family members and in particular the representative achieve greater academic training, they are in a better position to undertake the education and stimulation of the child's development.

The psychomotor profile of the infant students dictated that most of the participants presented a normal psychomotor profile and had no learning difficulties. These results are in line with the studies carried out by Valdés and Spencer (2011); Alcántara (2017) and Rodríguez (2016), which, assessed from a percentage point of view at a population level, are presented as satisfactory, but taking into account the particularities of each child, their individuality, their potentialities, and limitations, it is necessary to maintain differentiated educational attention for those who present a dysplastic psychomotor profile and slight learning difficulties to ensure their optimal development.

It is also evident that sociodemographic variables in this context are not expressed as factors with a marked impact on the development of the children studied. These parameters by themselves do not show affectations, as long as the adequate interaction of the child with the environment and effective communication is achieved (Rubio et al, 2012). For his part, Rodríguez (2016) highlights the relationship with

the adult at preschool age and the fact that during the socialization process the child is increasingly autonomous.

Parents are recognized as the first to transmit experiences to their children, to develop the talent and the essential skills for the assimilation of future learning, so this initial education is presented as transcendental for the life of the child and the cognitive and socio-affective development as part of his personality. In this sense, Moreno and Barahona (2016) showed that the low schooling of parents had a great incidence in children with psychomotor developmental delays.

The association was found in the frightened face and the provoked gender because boys score higher than girls, while in the case of the surprised face it is higher in girls, which could suggest a higher emotional development in girls. Authors such as Halberstadt and Lozada (2011) and Teixeira, Costa and Serrano (2018) report that girls perceive and identify emotions more effectively.

Finally, in which face is it more frightening in school children from single-parent families than in other typologies; they were also found in the psychomotor profile, where dyspractic school children score higher than normal ones. The manifestation of different types of emotions in these ages is variable, depending on previous experiences and the situation faced. If we take into account the particularities of this type of family, in most cases, made up only of the mother and her children, without the presence of the father, it could be the reason that influences this result. In the same way, dysplastic children, whose psychomotor development is not normal, impact on the development of intelligence and the emotional sphere.

The study carried out by Henao and García (2009) highlights the link established between the relationship with parents and the development of emotions, resulting from communication and the norms established in the family nucleus. The child, as a result of interaction with the environment, appropriates and displays various cognitive, behavioural and affective norms that are different in each individual and that generate varied manifestations and forms of expression. Among the limitations of the study are the reduced size and local character of the selected sample and the transversal design of the research that does not make it possible to establish relationships between the variables studied.

CONCLUSIONS

In summary, the results showed that the infant's psychomotor profile responds to the family's economic condition, in addition, the parents' academic training interferes with the child's motor ability, as well as the infant's emotional capacity, which prevents the child from relating efficiently to the environment; another important finding in the research is the relationship of the infant's psychomotor profile and its cognitive response capacity, which can be established as satisfactory in the population with a normal profile; motor ability is connected with cognitive and emotional skills when the child participates in the environment and with the people around him; so it is important to develop skills comprehensively in early childhood.

AUTHOR CONTRIBUTIONS

Martha Lucia Avalos Obregón participated in the conception of the research, search for information, data collection, statistical processing of the information, writing of the manuscript and final revision of the manuscript. Félix Zurita Ortega participated in the conception of the research, statistical processing, writing of the manuscript and the final review of it. Javier Cachón Zagalaz participated in the conception of the research, statistical processing, writing of manuscript and the final review of it.

SUPPORTING AGENCIES

No funding agencies were reported by the authors.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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