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Systematization of the Psychomotor Activity and Cognitive Development

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ABSTRACT

The aim of the study is to show how the habitual practices of psychomotricity from 12 months old can raise the cognitive development of children. Over the last years there has been an increase of studies related to the effect of the practice of physical-motor exercise on the cognitive function. The psychomotor development in childhood is the basis of the mental development in the scholastic age. The knowledge that the studies can bring from Cognitive Neuroscience allows optimising the process of training-apprenticeship. We selected 26 children between 12 and 22 months old divided in three groups: G0, G1, and G2. During the training period (5 months) G0 took part in psychomotricity sessions, G1 performed a psychomotor session per week, and G2 performed two sessions per week. All groups held one session every week during the practice period (23 months). The comparison of results obtained from the measures gathered in pre-post training phases and the post-final practice phase concludes that the systematization of the psychomotor activity has influenced cognitive capacities.

Sistematización de la actividad psicomotriz y del desarrollo cognitivo

Palabras clave:
Desarrollo cognitivo
Desarrollo motor
Psicomotricidad
Educación infantil temprana

RESUMEN

El objetivo de este estudio ha sido cómo pueden mejorar el desarrollo cognitivo infantil las prácticas habituales de psicomotricidad desde los 12 meses de edad. En los últimos años hemos observado que han aumentado las investigaciones sobre el efecto de la práctica de ejercicios físico-motores en la función cognitiva. El desarrollo psicomotor en la infancia es la base del desarrollo mental en la edad escolar. El conocimiento que la neurociencia cognitiva puede aportar a estos estudios permite optimizar el proceso de entrenamiento-aprendizaje. Elegimos 26 niños de entre 12 y 22 meses y los dividimos en tres grupos: G0, G1 y G2. Durante el periodo de entrenamiento (5 meses) el G0 participó en sesiones de psicomotricidad, el G1 llevó a cabo una sesión psicomotriz semanal y el G2 dos sesiones semanales. Los tres grupos participaron en una sesión semanal durante el periodo de práctica (23 meses). De la comparación de los resultados obtenidos de las medidas de las fases previas y posteriores al entrenamiento y de la fase posterior a la práctica final se concluye que la sistematización de la actividad motriz ha influido en las capacidades cognitivas.

Different studies show that the habitual physical and sport practice in scholastic age promotes cognitive capacities. Research has shown that children who regularly practice sport have a higher cognitive development.

In recent years, there has been a growing research interest in the effects of physical activity on cognitive abilities. Meyer and Kieras (1997) discussed that executive abilities are some of the cognitive aspects that benefit the most from physical activity in children. A recent study indicated that performing systematic physical activity increased significantly the attentional performance in children by 15% to 25% (Moratal, Huertas, Boltá, Zahonero, & Lupiañez, 2008). The research showed that regular physical activity improved general cognitive abilities and that children who were engaged in such planned activities were 15% faster in reaction time tasks whereas children who practiced limited physical activity had 7% more errors in these tasks. The study also revealed that children who played collective sports such as football, basketball, handball, or hockey had a 25% improvement in their ability in discriminating between relevant and irrelevant stimuli, and 15% in their ability to discriminate between similar stimuli, compared to those who performed individual sports such as swimming, running, or cycling.

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Castelli, Hillman, Buck, and Erwin (2007) also pointed out that the aerobic capacity is related to a better academic achievement in primary school, especially in Mathematics and reading abilities. In the same vein, Hillman, Erickson, and Kramer (2008) stated that physical activity has a positive impact on cognition across lifespan and that these effects are due to an increase of blood flow in the brain.

The present study focuses on psychomotor education during early childhood development, integrating body development, emotions, and cognitive activity.

From psychomotricity, infants have the opportunity to play with objects and in their context. The concept "psychomotricity" contains the "psycho" term, which refers to the psychological activity at the cognitive and affective levels, and the "motricity" term, which refers to movement. Thus, psychomotor activity can be defined as the faculty that allows, facilitates, and enhances physical, psychological, and social development in children through movement (Herrera & Ramírez, 1993). The concept includes an evolutionary notion by which there is an interaction between neuromotor (motor development) and psychological (cognitive and affective development) functions that take place during a unique and unidirectional process where the child's body is the main element in touch with the environment. Psychomotor education has the aim of psychological maturation in children.

As Aucouturier (2004) indicates, psychomotricity is based on every person's experience, in relation to his/her body, the environment, and the relationship with people.

Different studies have recently demonstrated that a good psychomotor development in early childhood is the basis of later mental development. During the first years of life, psychomotricity plays a very important role, because it promotes child's intellectual, affective, and social development, favoring the relation with his/her environment and taking into consideration their individual differences, needs, and interest.

Salvatierra (1999) considered that a good psychomotor development is a predictive factor in the onset of higher functions; an optimal psychomotor development provides a good level of neuronal connections that allows learning as well as exploration through movement.

Ramos et al. (2008) showed that psychomotor development from 6 to 20 months is higher for mental development. We share Deval's assumption that psychomotor development is the basis for mental development.

Mas and Castellà (2016) showed that psychomotricity is a valid tool that contributes to children's development and helps future learning. Movement can improve the development of cognitive structures related to attention, memory, perception, language, and thinking, which will help interpret concepts such as space, time and speed. Moreover, their own movement becomes more autonomous and conscious through language and expression. These results suggest that systematizing body experiences from the first months of life facilitates the emergence of motor and cognitive skills and also leads to expand the acquisition of emotional and affective content.

From this perspective, we see psychomotor education, when it is considered from an active pedagogical standpoint that is active, critical, and flexible, as a path leading to advances in the development of children's intellectual, emotional, and social skills.

The aim of this study is to analyze child's development in relation to psychomotricity over a 23-month period.

Method

Subjects

Twenty-six children aged 11 to 22 months old from an early childhood education school in Barcelona province were selected. The school had an educational project based on psychomotor education, promoting learning throughout movement.

Families gave consent to children's participation in the study and to the recording of sessions. Children's names were replaced by numbers.

Material

The Merrill-Palmer-R test was used in this study (Roid & Sampers, 2011). It is an individual battery that assesses general development (General Index) of children from 0 months to 6.5 years old. Five specific areas are examined: a) cognitive development, which evaluates verbal and non-verbal reasoning, memory, visual-motor coordination, and speed of processing; b) motor skills development, which assesses fine and gross motor skills; c) language and communication skills, which evaluates receptive and expressive language; d) socio-affective development; and e) adaptive behavior, which explores the extent and quality of social and affective relationships through questionnaires applied to parents. In the present study, the General Index and cognitive and motor skill development were assessed.

Procedure

By psychomotricity is meant a practice that allows a person's overall development by means of free and spontaneous body movements and its physical, symbolic and cognitive interactions with the environment.

Each psychomotricity session lasted 45 minutes and consisted of three short periods: welcoming the whole group and preparation for the session, free playing that involved motor movements, and back again to group session at the end. The session was based on Aucouturier's (2004) methodology, according to which the main focus is free and spontaneous movement in infants' interactions with their environment at physical, symbolic, and cognitive levels. This methodology was approved by the European Association of Psychomotor Practice and Training Schools (ASEFOP).

The study had two parts:

a) A 5-month psychomotor training period divided in 3 groups:
   G0: 11 children who did not hold psychomotricity sessions.
   G1: 8 children who held one psychomotricity session every week.
   G2: 7 children who held two psychomotricity sessions every week.
b) A 23-month psychomotor practice period. The study's groups (G0, G1, & G2) held one psychomotricity session every week. All groups performed a systematic pattern of the activity.

Results

Table 1 shows information on development scores.

The results in Table 1 show differences between the three study groups (G0, G1, and G2) and differences between the cognitive area, the motor ability, and the General Index of development in the different measurement times: at the beginning of the study (PRE measurement), at the end of the training period (POST measurement), and at the end of the psychomotor practice (FINAL measurement).

The mean differences between the three groups were subjected to a one-way ANOVA, showing that the three factors were significant: General Index ($F = 21.50$, $p = .000$), Cognition ($F = 6.32$, $p = .006$), and Motor Ability ($F = 14.09$, $p = .000$).

To assess the psychomotricity training period, mean differences are calculated between Pre and Post for each measurement within a group and to assess the psychomotricity practice period mean differences are calculated between Post and Final for each measure within a group (see Table 2 and Figures 1 and 2).

Table 1. Descriptive Statistics of the General Index (IG), Cognitive Development (Cog) and Motricity Development (Motr) for Each Group of Study in Pre-Measurement, Post-Measurement and Final-Measurement

Group 0	*N*	Min	Max	Mean	*SD*
PRE IG	11	10.50	17.00	14.0909	1.74382
PRE Cog	11	9.50	19.50	15.5909	2.52802
PRE Motr	11	12.00	17.50	14.1364	1.48477
POST IG	11	14.50	18.00	16.1360	0.97700
POST Cog	11	15.50	19.50	17.2273	1.16969
POST Motr	11	12.00	21.00	15.7273	2.44299
FINAL IG	11	29.50	44.00	35.9545	4.32698
FINAL Cog	11	30.00	43.00	36.4091	3.45556
FINAL Motr	11	33.50	45.00	36.6818	3.49480
Group 0	*N*	Min	Max	Mean	*SD*
PRE IG	7	17.50	22.00	20.2857	1.55073
PRE Cog	7	16.50	21.50	19.0000	1.70783
PRE Motr	7	16.00	22.50	19.4286	2.68373
POST IG	7	20.50	24.50	22.6430	1.43510
POST Cog	7	19.00	22.00	20.7143	0.95119
POST Motr	7	22.50	23.50	23.0714	0.53452
FINAL IG	7	36.50	45.00	40.8571	3.23669
FINAL Cog	7	37.00	46.00	40.6429	3.19784
FINAL Motr	7	35.00	55.00	44.1429	8.42968
Group 0	*N*	Min	Max	Mean	*SD*
PRE IG	8	14.50	22.00	19.1250	3.00892
PRE Cog	8	15.50	21.00	18.6250	2.34140
PRE Motr	8	14.00	23.00	19.5625	3.45830
POST IG	8	21.50	25.00	23.5000	1.13390
POST Cog	8	18.00	24.50	21.4375	2.16197
POST Motr	8	21.00	24.50	23.3125	0.99777
FINAL IG	8	40.00	49.00	42.6250	3.17074
FINAL Cog	8	36.00	43.00	40.5625	2.51336
FINAL Motr	8	34.50	55.00	42.6250	8.24080

Table 2. Descriptive Statistics for Differences between Pre- and Post-Measurement (Training Period) and between Post- and Final Measurement (Practice Period) for Each Group

		Related Differences				
		Mean	*SD*	Sig.	95% Confidence Interval	
					Min	Max
G0	Training period	-2.04545	2.18466	.011	-3.51313	-0.57778
G0	Practice period	-19.81818	3.78994	.000	-22.36430	-17.27207
G1	Training period	-2.35714	1.70084	.010	-3.93016	-0.78413
G1	Practice period	-18.21429	2.85565	.000	-20.85533	-15.57325
G2	Training period	-4.37500	2.08310	.001	-6.11651	-2.63349
G2	Practice period	-19.12500	2.97309	.000	-21.61057	-16.63943

The results in Table 1 and 2 show differences between development scores in cognitive and motor ability areas among the 3 groups of study. During the training period, G0 showed a lower difference (p = .001) than G1 and G2. All children performed identical activities except the psychomotricity activity in the early childhood education school. This difference may be due to the systematization of the psychomotor activity. But during the practice period, the G0 had a larger difference (p = .000) than G1 and G2. G0 may reach the same development levels as groups G1 and G2 during the following 23 months. However, the systematization of the psychomotricity activity in the three groups may be the cause of the optimal development level, especially in G0, which did not hold psychomotricity sessions in the training period.

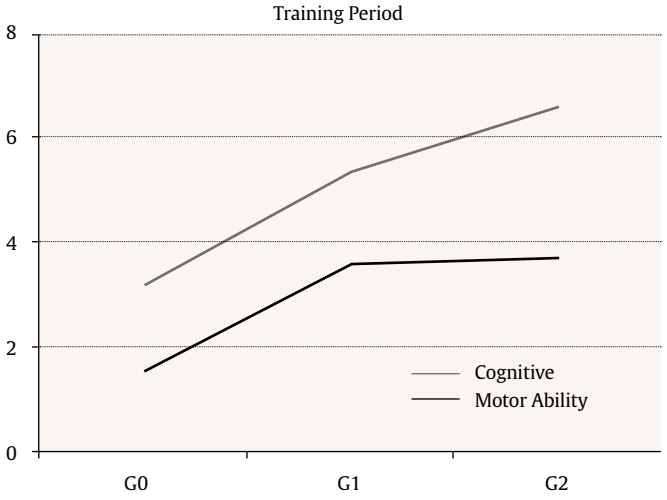

Figure 1. Mean Difference of Development Punctuations in Cognitive and Motor Ability Areas during the Training Period.

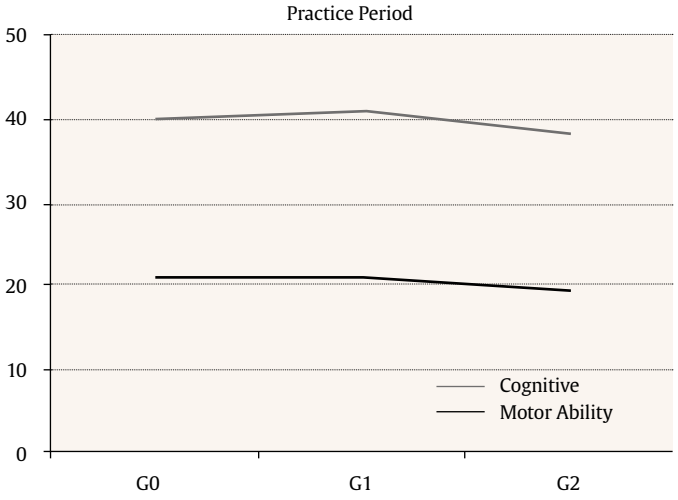

Figure 2. Mean Difference of Development Punctuations in Cognitive and Motor Ability Areas during the Practice Period.

During the training period, the results in Figure 1 show that motor ability and cognitive areas are higher in G1 and G2 than in G0. The motor ability area is higher than the cognitive area in G1 and G2; but both areas have the same development level in G0. During the practice period, the results in Figure 2 show differences among the three groups in the motricity area, but there are no differences in scores in the cognitive area. If we compare the two areas in the groups, the cognitive areas always reach higher scores than the motricity areas in groups G1 and G2.

Discussion

Children's education contributes to emotional, physical, motor, social, and cognitive development, providing them with an atmosphere of trust and a welcoming environment. At this stage, 0-6 years old, we talk about developing basic skills because children lack autonomy elements. Abilities are the skills and aptitudes that enable them to perform tasks, exercises, and activities. Throughout the nursery school stage, children will develop some motor skills, as well as cognitive, emotional, and personal skills. In this sense, psychomotor education enables the development of these capacities.

In line with Salvatierra (1999), the results of the study confirm that a good psychomotor development is a protection factor in

the setting-up of higher functions. A good motricity development guarantees that there is a good cognitive development later in the infancy.

In the same way that Ramos et al. (2008), we can note that the psychomotor development before being 20 months old is superior to mental development. These results indicate, as Deval, that psychomotor development is the base upon which mental development is established. The conclusion of this study is that without psychomotor development, cognitive development is severely compromised.

Child's physical experiences are the underpinnings of his/her intelligence. In this study, knowledge, thinking, and creativity are all shown to be physical processes, because they are developed when the child moves freely in a physical, symbolic, and cognitive interaction with his/her environment.

We agree with Aucoutourier (2004), who contends that psychomotricity has a fundamental role in the harmonious development of the child. These results indicate that psychomotor activity always plays a role in development, beginning in the first year or later.

To conclude, as our previous research revealed (Mas & Castellà, 2016), psychomotricity is a necessary activity in early childhood that can be used to identify problems in developing skills in the pre-school period and cognitive, academic, and socio-emotional problems of development in the primary education period. Psychomotricity should be a must in the early education phase (from 1 to 6 years old). It is a fun and relational activity that contributes to the optimal child's development.

Conflict of Interest

The authors of this article declare no conflict of interest.

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