

## **Design, validation and administration of an observation tool for assessing water psychomotor skills in pre-school education**

### **Diseño, validación y aplicación de una Hoja de Observación para la Evaluación de la Psicomotricidad Acuática (HOEPA) en edad infantil**

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#### **Abstract**

This research has aimed to create a new observation tool that lets the assessment of water psychomotor skills as well as the knowledge of its current state of development through its administration. In order to that, 8 experts (Physical Education teachers and swimming monitors all of them), have analyzed the Observation Tool for Assessing Water Psychomotor skills, composed by 5 factors (familiarization with the context, balance, displacement, handling and social relationships) reporting satisfactory results. Furthermore, the water psychomotor development of 58 children aged between 3 and 6 years old was studied. Displacement and handling factors got the highest values meanwhile social relationships got the lowest value. Likewise, 5-6 years old group showed significant higher levels of water psychomotor development than 3-4 years old group.

#### **Keywords**

Motor skills; motor development; water activities; pre-school swimming.

#### **Resumen**

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Esta investigación ha pretendido crear una nueva hoja de observación que permita evaluar la psicomotricidad acuática así como conocer los niveles actuales de desarrollo de ésta mediante su aplicación. Para ello, 8 jueces expertos (maestros de Educación Física y monitores de natación todos ellos), han analizado la Hoja de Observación para la Evaluación de la Psicomotricidad Acuática (HOEPA), compuesta por 5 factores (familiarización con el medio, equilibrio, desplazamientos, manipulaciones y relaciones sociales) obteniendo unos resultados satisfactorios. Además, se estudió el desarrollo psicomotor en el medio acuático de 58 niños de entre 3 y 6 años de edad destacando los factores desplazamientos y manipulaciones como los de puntuaciones más altas y relaciones sociales como el de puntuación más baja. Asimismo, el grupo de niños de 5-6 años mostró unos niveles de desarrollo significativamente superiores al grupo de 3-4 años.

### **Palabras clave**

Habilidades motrices; desarrollo motor; actividades acuáticas; natación infantil.

### **Introduction**

Psychomotricity term originates during first half of 20<sup>th</sup> century, linked to psychology to remark the close relationship between “psique” and its status (motricity) as Gutiérrez (1991) points. It appears as a trial of exceeding the anatomy-clinical model that presents humans as a unit who lives and expresses globally, through psycho-motor and socio-affective channels (Le Boulch, 1997). During its evolution, Psychomotricity has assimilated new orientations and concepts related with trends that have been imposed in each scientific and historical period (Arnaiz, 1991, Bernardo de Quirós, 2006).

A first approach to a definition of psychomotricity shows a wide range of psychomotricity theories and scientific perspectives, with different practices and methodologies.

Psychomotricity is a technique to work on psychomotor development and, consequently, to empower psychological development in general. In this way, it is

useful for any age people but is especially interesting during early childhood due to child own features' (Coste, 1978; Fonseca, 1997; Muniáin, 1997; Odena, 1980).

It is important to remark that psychomotricity refers to that field of knowledge that aims to study the elements implied in any experience and movement, from perceptive-motor process to symbolic representation, including body organization and progressive integration of activities' space-time coordinates (Bucher, 1976). In this context, psychomotor work is considered as the sensory, motor, intellectual and affective experiences' synthesis that let the creation of new traineeships from any spontaneous or specifically planned activity (Le Boulch, 1997).

### *Psychomotricity in sports and Physical Education*

The lack of consensus between psychomotricity specialists and the coexistence of several theoretical and methodological orientations suppose contradictory positions to consider the inclusion of psychomotricity in educative centres' curricula (Arnaiz and García, 1996).

This confusion has reported enthusiastic and suspicious attitudes about the validity, efficacy, convenience, methodology, contents and consequences of this educative area because its great influences in materials and teacher training to achieve an adequate psychomotor work (space-time, corporal schema, lateralization, etc.) with implications in neurological, psychological and pedagogical areas (Comellas and Perpinyá, 2003).

Initially, psychomotricity was born as a therapy method in order to ease the development of child with different psychomotor problems (Aucouturier and Lapierre, 1977; Cobos, 2001; Richard and Rubio, 1996). Despite of the fact that psychomotricity has already demonstrated its efficacy at this respect, not using this method with any

child, in an educative environment and even in other ages and contexts seemed inappropriate.

Despite the great importance of psychomotricity during the child first years of life, there are many educative centres that refuse using psychomotricity or it is relegated to a second level (Cantuña, 2010; Osorio and Herrador, 2007). Psychomotricity is useful to make children improve their motor traineeships, evolve their personality, become more autonomous as well as develop their socialization skills with their peers and adults.

Psychomotricity used to be used just in case the child had either a delay psychomotor development or a disability or any type of weakness but, according to Pineda (2008), nowadays psychomotricity is growing and is being used to improve the development of any child.

Furthermore, nowadays sedentary lifestyle index is very high and the actual practice time in Physical Education lessons is too short thus it is difficult to promote a healthy lifestyle among children. It would report consequences that become evident during adulthood as Díaz (2009) points; heart diseases and diabetes is increasing among children and teenagers; this increasing could be mainly related to overweight and obesity in early ages. Therefore, extra-scholar lessons (like swimming) can contribute to achieve these goals (Mollá, 2007; Montesinos, 2005; Orts, 2005; Sánchez, 2003).

Psychomotricity is one of the five tends that are part of Physical Education curricula. Some teachers affirm that they do not teach psychomotricity but base physical education so, according to them, it means that they work on capabilities and skills that are necessary during early childhood to develop multi-laterality and to let work more complex skills later (Libardo, 2010).

Nowadays, psychomotricity tends in our classrooms are oriented to three different goals (they three aim to obtain an adequate development of the student as well as to prevent several scholar maladjustments). According to Hernández Fernández (2008), these tendencies are:

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- Psychomotricity re-education: Pierre Vayer and Louis Picq pursue the restoration of the individual to a normal state as consequence of a physiological or motor disorder, or even both at the same time.
- Psychomotricity therapy: Ajuriaguerra wants to approach the students' development as close as possible to normality, when they have psychological or physiological problems.
- Psychomotricity education: There are several authors who focus their efforts on early scholar ages, in order to let them acquire a base of motor skills that ease the later assimilation of school contents. In this tendency, Hernández Fernández (2008) remarks three school of thoughts:

1. *Pierre Vayer's Psycho-pedagogical school of thoughts.* This psychologist defends that psychomotricity education let children achieve: an adequate boy development (motor) related with the own movement; an adequate mental development (cognitive) related with the acquisition of Basic notions; and an adequate emotional development (social and affective) because he defends that a child who can move and discover the World is a well adapted and happy child.

2. *André Lapierre's and Bernard Aucouturier's Psychomotor education.* Their thoughts fit with a non directive methodology, where the child is in a situation of creativity, meanwhile the teacher assumes the role of observer and helper to find a motor solution. From this point of view, the development of all educative features is pursued through the experienced body work and student movement, as means to relation and communication.

3. *Jean Le Boulch's Psychokinetic*. This school of thoughts defends the development of fundamental skills, on the same level as a better adaptation to social context, remarking lived experiences and using group dynamics to achieve a reciprocal structuring between external World and children's internal world.

### *Psychomotricity in aquatic activities*

The practice of aquatic activities is considered as one of the most complete and appropriate activities for children, adults and old people (Morales, 2010). When practicing these activities, a global development is obtained, in a physical, psychological and social way, and, at the same time, there is a work of motor coordination where muscles as well as circulation and respiratory system are key factors (Navarro, 1995).

In this way, there are many authors who have demonstrated the benefits of aquatic activities practice during early childhood (Bernal, 2002; Del Castillo, 1997). In a cognitive level, Diem, Bresges and Hellmich (1978) and Ahr (1994) have verified that those subjects, who used to practice aquatic activities during their childhoods, acquire a higher intelligence quotient and, consequently, they improve their attention and interdependence skills. Thus, aquatic environment can provide sensorial special capabilities as social integration (sight-touch), that are important to achieve a correct learning and an appropriate motor control, impossible to develop in other environments during these ages (Numminen and Sääkslathi, 1992).

Gutiérrez and Díaz (2001) observed that aquatic practices in early childhood improved significantly the cognitive fields of children as well as social relationships and personal autonomy. In that way, these authors registered improvements since the first week of aquatic activities practice.

On the other hand, aquatic activities prevent potential spine deviations, psychomotor delays, muscular atrophy and its regular practice is considered as a system of therapeutic rehabilitation, improve motor skills, develop self-confidence, survival of children in water as well as fine and gross motor skills, the communication and socialization, reporting a better quality of life (Cirigliano, 1989).

Regarding the duration of aquatic programs for children, Numminen and Sääkslahti (1997) affirm that a nine month-program with only one lesson per week is enough to achieve an adequate motor development and that the age is a key factor to decide when to start participating in these swimming programmes.

### *Goals*

Furthermore, the main aims of this study are: firstly, to design and validate an observation tool to assess aquatic psychomotricity and, secondly, to know psychomotor development level of early children, with regard to participants' age.

## **Methodology**

### *Participants*

Sample was made up by two types of participants. On one hand, in order to design and validate the observation tool, the cooperation of 8 expert judges, who were teachers specialized in Physical Education and swimming or aquatic activities instructors all of them. They all have more than 5 years experience in early childhood education or primary education as well as in aquatic after-school activities.



Secondly, the observation tool was used to gather data from 58 boys and girls aged between three and six years old ( $M = 4.56$ ;  $S.D. = 1.15$ ). Participants received aquatic activities lessons in three sport centers in the Region of Murcia. They attended twice a week to aquatic psychomotor lessons whose duration was 45 minutes.

### *Instrument*

*Aquatic Psychomotricity*: “Hoja de Observación para la Evaluación de la Psicomotricidad Acuática” (HOEPA) (Observation Sheet to Assess Aquatic Psychomotricity; OSAAP), was designed and validated *ad hoc* to this research. This instrument is composed of 22 items grouped into 5 factors: familiarisation with aquatic environment (e.g. “He goes into water being seated on pool edge”), balance (e.g. “He keeps flotation without help”), displacement (e.g. “He is able to displace with floats”), handlings (e.g. “He does not have problems to displace with objects in his hand”) and social relationships (e.g. “He pays attention to the teacher”). These items are evaluated in a Likert scale from (1) *never* to (5) *always*.

### *Procedures*

The definitive observation tool was created in 5 stages, following Carretero-Dios’ and Pérez’ (2007) recommendations. Stage 1 consisted in observation tool design from a bibliographic review of papers related to this field and a first approach with a 44 items tool, which was submitted to be reviewed by expert judges. After the first revision, 28 items were selected, so they were part of a second version of the “Observation Tool for Assessing Water Psychomotor Skills”. This tool had a short introduction that explained its purpose, how to assess the items as well as how to complete it. Next, a sort of questions about socio-demographical data was introduced in



order to gather information about age, sex and weekly water psychomotor practice. Later, the trainer or teacher could fulfil the items in a Likert scale of 5 options. Items were grouped in five factors: familiarization with aquatic environment, balance, displacements, handlings and social relationships.

Second stage aimed to calculate content validity. In order to reach optimal levels of content validity, judge experts were consulted (Wiersma, 2001). To that end, the collaboration of 8 judge experts was claimed. These judge experts did a qualitative revision about introductory information and items as well as a tool global valuation. Furthermore, they were invited to sign in a 0 to 10 scale how appropriate the initial information was. Finally, regarding the items, they were invited to evaluate:

- Level of belonging to the study goal (content): To what extent each item should be part of the tool observation was registered. In order to that, judge experts pointed in a 0 to 10 scale the level of belonging of each item to the global tool (0 = completely inadequate, 10 = completely adequate).
- Level of precision and adaptation (style): The level of precision when defining and redacting each item was assessed. Analogously, judge experts pointed in a 0 to 10 scale the level of precision and adaptation of each item to the global tool (0 = completely inadequate, 10 = completely adequate).

Third stage supposed the interpretation of experts' answers, so some items were modified or even removed. These experts' valuations (quantitative and qualitative) are presented in results section.

In the forth stage a test-retest analysis was developed in order to assess the level of comprehension by trainers and teachers and the observation tool reliability. Having acquired the informed consent from families and sport centres, the participants were evaluated in one lesson under the same conditions. Each assessment took approximately about 20 minutes; no problems occurred during test implementation. Participants were assessed in two occasions, following Nevil, Lane, Kilgour, Bowes and Whyte (2001) and Balluerka, Gorostiaga, Alonso-Arbiol and Aramburu (2007) guidelines. Both

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measurements were separated in time for a week and were developed under the same conditions (Baumgartner, 2000).

### *Data analysis*

Fifth stage referred to data analysis. In order to know items reliability, Kappa index was calculated meanwhile blocks' internal consistency was determined with Cronbach's alpha test (Conroy and Metzler, 2003). To calculate the content validity, V Aiken's was used (Penfield and Giacobbi, 2004). Afterwards, in order to establish the water psychomotor level skills of children, descriptive statistics of all variables were analyzed (means and Standard deviations), regarding participants' age. Furthermore, the association between different variables was calculated with non-parametric test of Mann Whitney U. Significant results were considered when significance was over 95%. Data were analyzed using SPSS 21.0 for Windows version.



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### **Results**

#### *Validity of observation tool for assessing water psychomotor skills through judge experts*

There was not any judge expert who did negative comments about the initial redaction of introductory information. In concrete, they reported a mean value of .94 about its adaptation, which is considered as very high.

Likewise, with regard to items valuation, those items that fitted any of the following conditions were removed:

- In qualitative valuation, more than three judge experts pointed an inconvenient about item design. In this way, items 12, 17 and 18 were removed.
- Those items with a V Aiken's lower than .70 (Penfield and Giacobbi, 2004). In this way, items 3, 8 and 26 were removed.

On the other hand, criteria for modifying items were:

- In qualitative valuation, any judge expert pointed any inconvenient about item redaction. There was not any item removed.
- V Aiken's values were from .70 to .80. There was not any item removed.

Results referred to comprehension validity showed that there was not any trainer or teacher who used the observation tool that asked a question when registering data. Moreover, they valued from 7 to 10 the level of comprehension of all items. Results about the high answer frequency were lower than 90 % in all items; according to Zhu, Ennis and Chen (1998) these values are highly valid. In the same way, there was not any item that had a frequency of answer higher than 5 % in "Do not know / Do not answer" category.

### *Internal consistency*

Considering results (referred to internal consistency) that were calculated with Cronbach's alpha test, next values for each factor were reported: familiarization with aquatic environment ( $\alpha = .67$ ), balance ( $\alpha = .52$ ), displacements ( $\alpha = .95$ ), handlings ( $\alpha = .89$ ) and social relationships ( $\alpha = .79$ ). The internal consistency of the observation tool was  $\alpha = .92$ .

## Reliability

Finally, to study reliability values (test-retest) of the whole observation tool, coefficient of intra-class correlation was developed, reporting a value of .83 meanwhile Kappa concordance index was applied for each item (Table 1), achieving very high values (Altman, 1991; Atkinson and Nevill, 2000). Furthermore, V content Aiken's reported values over .75 and V style Aiken's had values higher than .90, what is accepted by Penfield and Giacobbi (2004).

Item	V style Aiken's	V style Aiken's	Kappa index
He goes down ladders without difficulties	.99	1	.94
He does not cry when going into water	.98	.95	.96
He goes into water being seated on the edge	.96	.96	.90
He does not feel fear when jumping into water	.95	.97	.96
He displaces catching the edge	.82	.95	.84
He submerges his head into water	.83	.95	.89
He completely submerges himself catching the edge	.94	.96	.89
He picks up a ring from the bottom of the wading pool	.89	.98	.89
He keeps floating with help	.85	.97	.75
He keeps floating without help	.87	.99	.95
He is able to displace with corks	.94	1	.75
He is able to displace without material help	.97	.98	.75

He is able to displace without catching floating buoy lane-markers	.86	1	.71
He is able to displace in the ventral position	.87	.96	.79
He is able to displace in the dorsal position	.87	.96	.76
He starts practicing swimming styles	.87	1	.81
He is able to pick up different size materials and carry them to the edge	.81	1	.98
He does not have problems to displace with objects in his hands	.82	1	.95
He has a good relationship with his classmates	.87	.85	.75
He pays attention to explanations	.84	.91	.78
He bothers his classmates	.89	.87	.79
He collects materials	.86	.85	.74

Table 1. Judge experts' quantitative valuation about items content and style in the observation tool for assessing water psychomotor skills.

### *Descriptive statistics*

In table 2, descriptive statistics of the five water psychomotor factors are presented. It is possible to observe that participants show high values, from 3 to 4 points in all water psychomotor factors. Although values have been similar, displacements and handlings could be remarked as the highest and social relationships as the lowest. According to Bollen's and Long's (1994) recommendations, asymmetry and kurtosis indexes are close to 0 and lower than 2 in any factor.

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Aquatic psychomotricity	<i>M</i>	<i>S.D.</i>	Asymmetry	Kurtosis
Familiarization with aquatic environment	3.82	.75	.41	-.91
Balance	3.66	.47	-.121	1.57
Displacements	3.94	.87	-.62	-.95
Handlings	3.96	.84	-.60	-.30
Social relationships	3.32	.35	-.53	.82

Note: *M* = Mean; *S.D.* = Standard deviation

Table 2. Descriptive statistics of aquatic psychomotor factors.



In table 3, correlations among the different variables studied (calculated with Spearman ranks' test) can be observed. Familiarization with aquatic environment correlated positively with balance, displacements and handlings. Handlings correlated positively with balance and displacements. Displacements correlated positively with balance.

Familiarization with aquatic	Balance	Displacements	Handlings	Social relationships

		environment				
Familiarization with aquatic environment	Correlation	1.000	.373	.813	.878	.398
	Sig. (bilateral)		.066	.000**	.000**	.049*
Balance	Correlation		1.000	.679	.620	.198
	Sig. (bilateral)			.000**	.001**	.342
Displacements	Correlation			1.000	.916	.313
	Sig. (bilateral)				.000**	.127
Handlings	Correlation				1.000	.374
	Sig. (bilateral)					.066
Social relationships	Correlation					1.000
	Sig. (bilateral)					

Note: *M* = Mean; *S.D.* = Standard deviation; \* =  $p < .05$ ; \*\*  $p < .01$

Table 3. Correlations among the different variables studied.

### *Test of Mann Whitney U*

Next, table 4 shows the relationships among the five factors of aquatic psychomotricity and the age of participants. As observed, 5-6 years old children present significant higher values in familiarization with aquatic environment, balance, displacements and handlings factors.



Variable	Age				Sig.
	3-4 years old		5-6 years old		
	<i>M</i>	<i>S.D.</i>	<i>M</i>	<i>S.D.</i>	
Familiarization with aquatic environment	3.20	.31	4.38	.56	.000**
Balance	3.41	.54	3.88	.24	.026*
Displacements	3.29	.76	4.55	.39	.000**
Handlings	3.29	.65	4.57	.40	.000**
Social relationships	3.18	.38	3.44	.29	.152

Note: *M* = Mean; *S.D.* = Standard deviation; \* =  $p < .05$ ; \*\*  $p < .01$

Table 4. Aquatic psychomotricity regarding the age of participants.



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## Discussion

The main aims of this study were, firstly, to design and validate an observation tool to assess water psychomotor skills and, secondly, to know the level of aquatic psychomotricity in children with regard to their age. In this way, results confirm that Observation Tool for Assessing Water Psychomotor Skills (Annex 1) fits with the required values of reliability and validity that ensure its use with children. On the other hand, results referring to five factors of aquatic psychomotricity have shown that, broadly, participants demonstrated high values, coinciding with Navarro's (1995) results that correlated the practice of water activities with a complete physical, psychological and social psychomotor development as a starting point for motor coordination work.

Finally, with regard to age, results have shown higher values in four of the five factors as the participants' age increases. Specifically, these differences have appeared in factors related to physical and motor field (familiarization with aquatic environment, balance, displacement and handlings), meanwhile social relationships factor showed a higher value in older participants although differences were not significant. These data coincide with other studies' that remark that regular practice of water activities will report improvements in child psychomotor development level, and that this level will be higher as the age and experience increase (Bernal, 2002; Gutiérrez and Díaz, 2001; Moreno, Pena and Del Castillo, 2004; Numminen and Sääkslahti, 1997).

## Conclusions

Regarding the first aim of this research (and understanding it as a pilot study), the attached results confirm that the observation tool for assessing water psychomotor skills fits the necessary values of reliability and validity that ensure its use with children. This observation tool will let obtain useful information about the level of aquatic psychomotor skills development in children, making lessons and training sessions easier to design by teachers and trainers of swimming and water activities.

With regard to the second aim, data have shown medium-high levels of aquatic psychomotor development in children. Furthermore, the higher development in those older children has been demonstrated in factors related to motor field (handlings, displacements, familiarization with aquatic environment and balance) however in social relationships factor there are not differences regarding the age.

Nevertheless, these limitations could be related to sample size. Therefore, it would be interesting to develop future works that use a bigger sample, analysing the effects of other variables like sex, previous experience or weekly training hours. It also would be interesting the development of a longitudinal research with the implementation of an intervention program, using a control and an experimental group

in order to contrast the effects of different programs and aquatic psychomotor skills development in children.

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## Annexes

### *Annex 1. Observation tool for assessing water psychomotor skills.*

	Never	Hardly never	Someti mes	Almost always	Always
<b>Familiarization with aquatic environment</b>					
He goes down ladders without difficulties					
He does not cry when going into water					
He goes into water being seated on the edge					
He does not feel fear when jumping into water					
<b>Balance</b>					
He displaces catching the edge					
He submerges his head into water					
He completely submerges himself catching the edge					
He picks up a ring from the bottom of the wading pool					
He keeps floating with help					
He keeps floating without help					
<b>Displacements</b>					
He is able to displace with corks					
He is able to displace without material help					
He is able to displace without catching floating buoy lane-markers					
He is able to displace in the ventral position					
He is able to displace in the dorsal position					
He starts practicing swimming styles					
<b>Handlings</b>					
He is able to pick up different size materials and carry them to the edge					
He does not have problems to displace with objects in his hands					
<b>Social relationships</b>					
He has a good relationship with his classmates					
He pays attention to explanations					
He bothers his classmates					
He collects materials					