

THE INDEX OF AMPLITUDE OF BEHAVIOR AS A MEASURING INSTRUMENT OF SOCIAL ABILITY IN PRESCHOOL CHILDREN

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In order to assess the developmental validity of the Index of Amplitude of Behavior (IAB) as a measuring instrument of social ability in preschool children, the variation of this index was studied during an academic year in an Andalusian school. The social behavior of 31 preschool children (aged five) was observed during free play period and a measure of IAB for each subject was calculated chronologically through the whole study period. According to the data obtained in this study, 300 seconds of observation is a sufficient period of time to reliably estimate the Index of Amplitude of Behavior of a subject. An adjustment of the values of the IAB of each individual towards the mean of the IAB of all the individuals of the group was detected. This suggests that the Index of Amplitude of Behavior could be considered not only as a measuring instrument of social ability, but also an useful tool to explore the effects of peer-groups in socialization.

El índice de amplitud de comportamiento como instrumento de medida de la habilidad social en niños preescolares. Con el objeto de evaluar la validez del Índice de Amplitud de Comportamiento (IAB) como un instrumento de medida de la habilidad social de niños preescolares, se estudió la variación de dicho índice durante un año académico en un colegio andaluz. Para ello, se observó el comportamiento social de 31 niños (de 5 años de edad) en el recreo y se calculó cronológicamente durante el período de estudio una medida de IAB para cada sujeto. De acuerdo con los datos obtenidos, 300 segundos de observación se considera un período de tiempo adecuado para una estimación fiable del IAB de un sujeto. Se detectó un ajuste de los valores del IAB de cada individuo a la media del IAB de todos los individuos del grupo; lo que sugiere que el IAB puede ser además considerado como una herramienta útil para explorar la influencia de los grupos de pares en la socialización.

A successful adaptation to the school environment implies that children have success both cognitively and socially. In fact, social interaction with peers improves cog-

nitive achievement (Burlson et al., 1986). Free play, as confirmed in previous studies, is very important in children's school experience; it seems to be closely related to academic outcome and the acquisition and development of social competence (Pellegrini and Smith, 1993). Indeed, the behaviors that children learn in peer groups train them for adulthood society.

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The use of the construct social competence has been differently defined by each investigator (Dodge, Pettit, MacClaskey and Brown, 1986; Walden and Field, 1990; Waters and Sroufe, 1983; Wright, 1980). Though, in general, there is agreement in that social competence should be related to the capacity for establishing and maintaining social relationships (Waters, Noyes, Vaughn and Ricks, 1985). Thus, for Schneider (1993), social competence implies the ability to implement developmentally-appropriate social behaviors that enhance one's interpersonal relationships without causing harm to anyone.

Moreover, from our point of view, a single measure of social adjustment (i.e. implication in social interactions) is not sufficient to establish the degree of social competence of an individual. It is important to take into account the different behaviors that an individual performs in peer-groups, in order to know his or her social ability.

Preschool children's flexibility in employing a wide range of behaviors and strategies is representative of the behavioral complexity of the individuals at older ages. Following this reasoning, the number of different behaviors a young child exhibits in peer group settings might determine his or her level of social ability.

In previous studies the authors have designed an Index of Amplitude of Behavior (IAB) (Braza, Braza, Carreras and Muñoz, 1993) for each individual during free play periods. This index examines the contribution of time children dedicate to the different social patterns considered (it is calculated as an index of diversity applied to the time an individual dedicates to each pattern of behavior). Furthermore, this index was an useful measure to determine levels of social ability and could be used to study the contribution of several factors, both familial and cognitive, to the child's social competence (Braza, Braza, Carreras and Muñoz, 1994).

In order to validate the Index of Amplitude of Behavior as a measure instrument of social ability of preschool children, the following questions should be considered: Is children's social adjustment modified during the academic year? Is preschool children's capacity for developing different behaviors related to individual or school factors?

To answer these questions, in the present study the variation of the IAB during an academic year in an Andalusian school was analyzed. We have also pretended to determine the minimum period of observation needed for a reliable value of the IAB, considering the variation of this index with the progressing time of observation.

Material and Methods

The study was carried out at an elementary school in Cádiz (Southern Spain). The preschool children, members of a single group ($n = 31$; 23 girls and 8 boys, aged 5 years; $\bar{x} = 61.7 \pm 3.7$ months) were Caucasian and according to family income could be classified as middle-lower socio-economic class. Most of the parents had a primary or middle level of studies.

The area surveyed was a 190 m² patio with two distinct zones: one is a sports ground (football and basketball), and the other has a fountain and several trees. The preschool children shared the study area with children up to nine years old without any adult present.

Children were filmed (SANYO UMD6P video camera) while unaware of the observers, with prior consent of the parents and teachers, during 30 minutes of daily free play at least twice a week.

Behavior was recorded using the focal sampling and continuous recording methods (Martin and Bateson, 1986). The group filmed was selected at random, and the behavior of each child of the group was analyzed

sequentially with a program written in Fox-Pro (Microsoft Software), which provides the measure of true duration of the behavioral patterns performed each child in each sequence.

The social patterns considered (Table 1) are based on prior observations (Braza and Braza, 1989). Nevertheless, we previously revised those lists made by other authors, specially those studies more related with the behavior of preschool children (Blurton Jones, 1967, 1971, 1972; Brannigan and Humphies, 1972; McGrew, 1972; Smith and Connolly, 1972). In order to contribute to independence of the data no group was filmed excessively (\bar{x} = 49.30 sec., SD =31.34 sec). A total of 21142 minutes of observation (682 minutes/individual), obtained through the whole academic year was analyzed. The observations were carried out from November 1989 to June 1990. Recording occurred during three different periods separated by 10 days of holidays.

Table 1
Behavioral Patterns Considered (for further details see Braza et al., 1997)

Accompany	Lose object
Adjust	Obey
Allow reorientation	Offer
Approach	Order
Argue	Point
Arms round	Receive help
Attack	Reorientation
Avoid robbery	Role play
Call	Rough/tumble play
Cry	Ruled games
Feed	Scoff play
Follow	Show
Fondling	Smack
Get	Solitary play
Help	Take
Hug	Talk
Laughing	Threaten
Lead	Try to take
Leave	Turn back
Locomotion	Unruled games
Look at object	Vigilance
Look in direction	Watch

To measure the diversity of the behaviors shown by each subject, we used the Index of Amplitude of Behavior (IAB) (Braza et al., 1993, 1994). This index was calculated using Shanon's Index ($H' = -\sum P_i \ln P_i$) as a measure of diversity (Ludwig and Reynolds, 1988), with the relative frequency of time dedicated to the different behaviors considered.

For the statistical analysis of data we calculated the coefficient of variation of the IAB in each term and the Pearson's correlation between the values of the IAB in each term and in the whole academic year.

Results

The IAB for each subject was calculated chronologically during the academic year. Graphic representation of the IAB over time shows that by about 300 sec of observation the value stabilizes in all subjects (Figure 1).

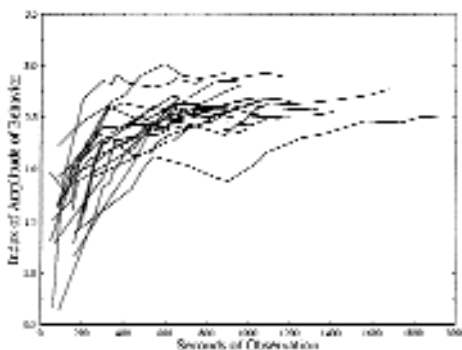


Figure 1. Variation of the Index of Amplitude of Behavior (IAB) of each individual according to the time of observation.

Because children leave the school twice a year for holidays, and taking into account that the value of IAB stabilizes by about 300 sec of observation, we have calculated the IAB for those subjects who have a minimum of 300 sec of observation in each term. If we compare the IAB in each of the terms,

we find a decrease in the coefficient of variation (Table 2). The decrease appears to be marginally significant according to the test of Lewontin (Zar, 1984).

towards a change in the diversity of the behaviors expressed between the first and the second terms.

Discussion

Despite the problems which may derive from the size and nature of the study sample, the results seem to confirm the fact that the IAB of all subjects increases at a first moment and stabilizes when the time of observation increases, though in a different value for each individual. Taking into account that the Amplitude of Behavior makes an important contribution to the social adaptation of each individual (Braza et al., 1994), we can argue that the IAB can be useful as a discriminating measure which evaluate individual differences in social ability. In any case, the testing of these results in larger samples would appear to be very interesting.

According to the data obtained in this study, the Index of Amplitude of Behavior of each subject reaches a stable value at 300 sec of observation from the moment in which the subject meets the rest of his or her peers.

However, over the course of the academic year, the Index of Amplitude of Behavior of each individual seems to gravitate towards the mean value of the study sample.

In a model for the development of peer relationships proposed by Whaley and Rubenstein (1994), it is suggested that behavioral similarity is what cements relationships. Considering that the benefits of the relations with peers are mainly social (Salzinger, Hammer and Antrobus, 1988; Smith and Connolly, 1980), perhaps preschool children become more conforming in order to consolidate their relationships and thereby enhance these social benefits.

Nevertheless, we also have to take into account the preschool children's possible interest in establishing differences between

Tabla 2
Mean, Standard Deviation (S.D.) and Coefficient of Variation (C.V.) of the Index of Amplitude of Behavior (IAB) in each Study Period Considered

	1st term	2nd term	3rd term
Mean	2.478	2.716	2.614
S.D.	0.338	0.247	0.241
C.V.	13.639 ^a	9.080 ^b	9.196 ^b
n	19	20	23

Differences between coefficients of variation (test of Lewontin):
 $F_{132}=2.313$, $F_{0.05(2)18,19}=2.55$; $F_{133}=2.099$, $F_{0.05(2)18,22}=2.43$;
 $F_{342}=1.02$, $F_{0.05(2)22,19}=2.48$

Considering that the IAB distribution in each term is not significantly different from a normal distribution (Test of Kolmogorov and Smirnov; $p>0.20$ in each case), we have calculated the correlation between the values of the Index of Amplitude of Behavior in each term and in the whole academic year (Table 3). Only the correlation of the IAB in the first term with the total IAB approaches a significant positive level. We could also point out that there is a tendency to-

Tabla 3
Pearson's Correlation of the Index of Amplitude of Behavior Obtained in the Different Periods Considered

1st term	2nd term	3rd term	year
1st term	$r=-.424$ $p=.079$	$r=-.260$ $p=.296$	$r=.458$ $p=.055$
2nd term		$r=-.128$ $p=.610$	$r=.197$ $p=.432$
3rd term			$r=.411$ $p=.090$

themselves and others, especially in concrete areas such as possessions and activities (Erwin, 1993). So, a deeper analysis is necessary to assess the possible existence of individuation in children's behavior, with each subject attaining a special role in the group, which would also reflect a decrease in the Amplitude of Behavior.

Future research on preschoolers might clarify these social processes of similarity or individuation, and it is possible that the Index of Amplitude of Behavior could be an useful variable to explore the social effects of peer groups during the academic year.

The correlation detected between the Index of Amplitude of Behavior of each child at the first term and the value obtained over all observations suggests that at the first contacts with peers children are already expressing their "measure of behavioral amplitude". In a previous study we showed that the Index of Amplitude of Behavior obtained

at the first term could be a good predictor for social adaptation of preschool children (Braza et al., 1994). The results of the present study confirm this approach. Therefore, to obtain a good mean of amplitude of behavior, it is advisable to observe the first peer encounters.

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Referencias

- Brannigan, C. R. and Humphries, D.A. (1972). Human non-verbal behavior, a means of communication. En N.G. Blurton Jones (Ed.). *Ethological studies of child behavior* (pp.37-64). London, U.K.: Cambridge Univer. Press.
- Braza, F. and Braza, P. (1989). Sexual differences in preschool children behavior. *Bulletin d'Ecologie et Ethologie Humaine*, 8, 18-26.
- Braza, P., Braza, F., Carreras, M.R. and Muñoz, J.M. (1993). Measuring the social ability of preschool children. *Social Behavior and Personality*, 21, 145-158.
- Braza, F., Braza, P., Carreras, M.R. and Muñoz, J.M. (1994). Factors affecting the social ability in preschool children: an exploratory study. *Behavioral Processes*, 32, 209-226.
- Braza, F., Braza, P., Carreras, M.R. and Muñoz, J.M. (1997). Development of sex differences in preschool children: social behavior during an academic year. *Psychological Reports*, 80, 179-188.
- Blurton Jones, N.G. (1967). An ethological study of some aspects of social behavior of children in nursery school. En D. Morris (Ed.). *Primate ethology* (pp. 347-368). London, U.K.: Wiedefeld and Nicolson.
- Blurton Jones, N.G. (1971). Criteria for use in describing facial expressions of children. *Human Biology*, 43, 365-413.
- Blurton Jones, N.G. (1972). Categories of child-child interaction. En N.G. Blurton Jones (Ed.). *Ethological studies of child behavior* (pp.97-127). London, U.K.: Cambridge Univer. Press.
- Burleson, B.R., Applegate, J.L., Burke, J.A., Clark, R.A., Delia, J.G. and Kline, S.L. (1986). Communicative correlates of peer acceptance in childhood. *Communication Education*, 35, 349-361.
- Dodge, K., Pettit, G.S., McClaskey, C.L. and Brown, M.M. (1986). Social competence in children. *Monographs of the Society for Research*

- arch in Child Development*, 51 (2, Serial No. 213).
- Erwin, P. (1993). *Friendship and peer relations in children*. Chichester: John Wiley and Sons, Ltd.
- Ludwig, J.A. and Reynolds, J.F. (1988). Diversity indices. En J.A. Ludwig and J.F. Reynolds (Eds.). *Statistical Ecology: a Primer on Methods and Computing* (pp. 85-10). New York: John Wiley and Sons, Inc.
- Martin, P. and Bateson, P. (1986). *Measuring behavior*. Cambridge: Cambridge Univer. Press.
- McGrew, J.M. (1972). Aspects of social development in nursery school children with emphasis on introduction to the group. En N.G. Blurton Jones (Ed). *Ethological studies of child behavior* (pp. 129-156). London, U.K.: Cambridge Univer. Press.
- Pellegrini, A.D. and Smith, P.K. (1993). School Recess: implications for education and development. *Review of Educational Research*, 63, 51-67.
- Salzinger, S., Hammer, M. and Antrobus, J. (1988). From crib to college: an overview of studies of the social networks of children, adolescents, and college students. En S. Salzinger, J. Antrobus and M. Hammer (Eds.). *Social Networks of Children, Adolescents, and College Students* (pp. 1-16). New Jersey: Lawrence Erlbaum Associates, Publ.
- Schneider, B. (1993). *Social competence in context: the contributions of family, school and culture*. Oxford: Pergamon Press.
- Smith, P.K. and Connolly, K.J. (1972). Patterns of play and social interaction in preschool children. En N.G. Blurton Jones (Ed.). *Ethological studies of child behavior* (Pp.65-95). London, U.K.: Cambridge Univer. Press.
- Smith, P.K. and Connolly, K.J. (1980). *Ecology of preschool behavior*. London: Cambridge Univer. Press.
- Walden, T.A. and Field, T.M. (1990). Preschool children's social competence and production and discrimination of affective expressions. *British Journal of Developmental Psychology*, 19, 550-560.
- Waters, W., Noyes, D.M., Vaughn, B.E. and Ricks, M. (1985). Q-sort definitions of social competence and self-esteem: discriminant validity of related constructs in theory and data. *Developmental Psychology*, 21, 508-522.
- Waters, W. and Sroufe, L.A. (1983). Social competence as a developmental construct. *Developmental Review*, 3, 79-97.
- Whaley, K.L. and Rubenstein, T.S. (1994). How toddlers "do" friendship: a descriptive analysis of naturally occurring friendship in a group child case setting. *Journal of Social and Personal Relationships*, 11, 383-400.
- Wright, M.J. (1980). Measuring the social competence of preschool children. *Canadian Journal of Behavioral Science*, 12, 16-32.
- Zar, J.H. (1984). *Biostatistical analysis*. Englewood cliffs, New Jersey: Prentice-Hall, Inc.

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