# QUALITY OF HOME ENVIRONMENT AND DEVELOPMENT OF CHILDREN: A STUDY USING 'HOME' INVENTORY

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**Abstract**: The preschool version of the HOME Inventory (Home Observation for Measurement of the Environment, Caldwell & Bradley, 1984) was used in a group of Portuguese preschool aged children and their families, all of which participated in the *European Child Care and Education Study (ECCE)*. The purpose of this study was twofold and started by the study of the psychometric properties of the HOME Inventory. The validity of the HOME Inventory was estimated and a factor structure emerged which was conceptually identical to the original one, although the number of subscales was reduced. Correlations of HOME global scores with other markers of family quality were moderate to high. The results obtained indicated that the instrument is relevant for the Portuguese cultural context and an adequate measure of quality of home environments of Portuguese families. A second step consisted in the analysis of the predictive power of the HOME global score regarding results of the participating children in the cognitive domain and adaptive behaviour, together with other relevant variables from the ecological context of the child, as well as with the child's characteristics. HOME scores were found to be the only significant predictor when results on the cognitive domain were considered and the most significant predictor for the results in adaptive behaviour.

**Key words**: HOME inventory, cognitive development, adaptive behaviour, preschool

**Qualidade do ambiente em casa e desenvolvimento infantil: Um estudo com o Inventário 'HOME' (Resumo)**: A versão pre-escolar do Inventário HOME (Observação em casa para Avaliação do Meio Ambiente, Caldwell & Bradley, 1984) foi utilizada num grupo de crianças portuguesas em idade pre-escolar e suas famílias, que participaram na *European Child Care and Education Study (ECCE)*. O estudo tinha dois objectivos e iniciou-se com o estudo das propriedades psicométricas do Inventário HOME. Foi estimada a validade do Inventário, tendo emergido uma estrutura fatorial conceptualmente idêntica à do questionário original, se bem que com um número mais reduzido de sub-escalas. A correlação entre os valores glo-

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bais do Inventário HOME e outros indicadores da qualidade familiar variou de moderada a elevada. Os resultados da validação mostraram que o instrumento é relevante para a o contexto cultural português, e que constitui uma medida adequada da qualidade dos ambientes das famílias portuguesas. O segundo objectivo consistiu na análise do poder preditivo do valor global do HOME em relação aos resultados obtidos pelas crianças nos domínios cognitivo e adptativo, a par de outras variáveis ecologicamente relevantes do contexto das crianças e das características da criança. Os valores do HOME foram os únicos preditores significativos quando se tomaram em consideração os resultados no domínio cognitivo e constituiram o mais significativo preditor do comportamento adaptativo.

**Palavras-chave**: inventário HOME, desenvolvimento cognitivo, comportamento adaptativo, pre-escolar

### Introduction

It is now a truism that home environment exerts a powerful influence on children's development. Decades of research from all over the globe confirm that families and, particularly, parents play an important role in the shaping of their children's lives.

According to Bradley (1995), the home environment fits into the definition of the child's microenvironment, which is regulated by the *developmental niche* of the family. Culture and socio-economic factors help to shape and to determine parenting, and so do neighbourhoods and communities. Beyond this ecological standpoint, it is also important to acknowledge that person and environment constantly interact and transform each other over time, such as is stated in the transactional approach to human behaviour and development.

The HOME inventory is a widely known instrument that has been used all over the world to assess quality of home environment. It rates the general quality of the home setting and parent interactions with children through a semi-structured interview conducted by trained interviewers. The 55 binary items that form the preschool version assess structural and process aspects of the child's home environment which are organized in eight sub--scales, respectively: *Learning Materials, Language Stimulation, Physical Environment, Responsivity, Academic Stimulation, Modelling, Variety of Experience,* and *Acceptance*. Bradley, Corwyn and Whiteside-Mansell (1996) examined 70 studies that have used the HOME Inventory in different countries, most of them showing identical correlations between HOME scores, family structure and family status variables and child results. The authors concluded that it globally appeared to be a valid measure of family environment, although some problems arise at the subscale level. Using the

HOME inventory outside the USA and in different cultural contexts requires some caution about ecological validity, and care must be taken to ensure that culturally relevant dimensions of the home environment are being tapped.

As previously stated, many studies have pointed out to the home environment as a relevant factor in the development of children. The HOME scores hold a strong relation with cognitive development, and their predictive power has been well documented as far as children's outcomes in the cognitive and language domains are concerned (Bradley, Whiteside, Caldwell, Casey, Kelleher et al, 1993; Gottfried & Gottfried, 1984; Luster & Dubow, 1992). HOME scores have also been found to mediate the effects of family poverty on children's IQ (Klebanov, Brooks-Gunn, McCarton & McCormick, 1998) and of parental characteristics such as alcohol abuse on children's development (Noll, Zucker, Fitzgerald & Curtis, 1992).

Although relations between quality of family environment assessed with the HOME Inventory and children's results in the cognitive domain are quite well documented in literature, the impact of family environment in other developmental areas, such as the adaptive behaviour domain, is not so clear, and studies in this area are needed.

The main research question that guided this study was, first and foremost, to determine the relevance of information gathered with the HOME inventory to the Portuguese socio-cultural context and what (if any) changes in the instrument should be made, as was the case with other cultural contexts. Once the adequateness of the instrument could be determined, the next objective was to determine whether HOME scores were related to results obtained by the participating children, in the cognitive and adaptive behaviour domains. In the affirmative case, it further mattered to understand such relations, determining the weight that HOME scores might have on children results, when compared to other variables from their ecological context, such as the socio-economical status of families, considering this variable's well-known association with quality of family environment in general and with HOME scores in particular

**Method**

*Participants*

A total of 215 families participated in the study. They came from two regions of Portugal, a Northern region, in the surroundings of Porto, (the second largest city in the country) and a Southern region, around Lisbon, the capital. Although it is not possible to consider such a distribution as representative of the whole country, it is a fact that approximately 40% of the Portuguese population concentrates in these areas, located near the coast.

The interior of the country, mostly rural, has for the last 25 years been subjected to intense migrations, towards the urban centres and to the coast areas.

In each region, a metropolitan and a non-metropolitan area were selected. The four geographical areas and the number of participant children drawn from each one of them is presented in Table 1.

Table 1. Distribution of participant families by area of residence

|  | *North* | *South* | *Total* |
|---|---|---|---|
| **Metropolitan** | 78 | 77 | 155 |
| **Non-metropolitan** | 30 | 30 | 60 |
| **Total** | 108 | 107 | 215 |

All children (110 boys and 105 girls) were Caucasian and had no diagnosed disorders or illness. Most of the children (83.3%) attended some kind of early childhood centre-based early education programme. By the time the families were visited and interviewed, children's age ranged from 45 to 57 months, with a mean of 49.2 months. In what concerns the number of children per family, 31% of the families had only one child, 45% of the children had one sibling and 24% of the children had two or more siblings. Most of the children lived with both parents and only 27 families were lone-parent. Other characteristics of the participant children and their families are shown in Table 2.

Table 2. Selected characteristics of families and children

|  | *M* | *SD* | *Range* |
|---|---|---|---|
| **Family Characteristics** (*n* = 215) |  |  |  |
| Age of mother (years) | 32.15 | 5.7 | 18 – 48 |
| Age of father (years) | 35.12 | 6.11 | 23 – 58 |
| SES index* | 2.07 | 1.09 | .40 – 4.40 |
| HOME Inventory (52 items) | 33.87 | 8.05 | 10 – 50 |
| **Child Characteristics** (*n* = 215) |  |  |  |
| (105 girls; 110 boys) |  |  |  |
| Age (in months) | 55.11 | 3.30 | 50 – 63 |
| Receptive Vocabulary | 95.66 | 12.46 | 69 – 131 |
| Adaptive Behaviour | 136.5 | 15.08 | 81 – 176 |

*Note:* * Estimated as a *numeric variable*, from mother and father school level, mother and father occupational level and family income. More detailed information on the SES index can be obtained in Abreu-Lima, I. (2003).

*Instruments*

*Questionnaire on Demographic data*. Information on family background variables were collected, using a structured interview.

*Peabody Picture Vocabulary Test – Revised* (PPVT-R; Dunn & Dunn, 1981). The revised version of the Peabody Picture Vocabulary Test was administered to all children at home, providing a measure of the child's level of receptive vocabulary. The scores obtained are considered to be reasonable good estimates of the children's verbal intelligence. Since no standardization studies for the PPVT-R have been conducted in Portugal, children's raw scores were used as results.

*Vineland Adaptive Behaviour Scales – Survey form* (VABS; Sparrow, Balla & Cicchetti, 1984). The survey form of the Vineland Adaptive Behaviour scales was used to assess children's adaptive behaviour. These scales evaluate the degree to which the child has mastered the skills that are needed to perform daily activities and to obtain self-sufficiency. Taking into account the age of the children in this study, a pool of 64 items of the Survey form was used, each one expressing a skill that the child might or might not have mastered. In each item the parent must answer using a 3 point scale that describes how well the child performs the skill. A composite score was obtained by adding the scores in all the items, as well as four scores corresponding to four developmental domains: Autonomy in daily life activities (including the personal, social and community domains), Socialization (referring to interpersonal relations, play and leisure, and sensitivity to others), Communication (receptive and expressive domains) and Motor development (gross and fine motor domains). Children's raw scores were used.

EAS Temperament Scale for Parents (Buss & Plomin, 1984). The EAS Temperament Scale includes 20 items. The version used in this study is an adaptation of the original scale (Abreu-Lima, 2003) and evaluates four dimensions of child temperament, respectively Energy (5 items, alpha=.68), Sociability (6 items, alpha=.79), Negative Emotionality (6 items, alpha=.68) and Introversion (3 items, alpha=.53). Each child was scored on each of the four subscales. The first two refer to positive temperament dimensions, and evaluate the child's level of activity and proneness to interact with other people. Negative emotionality and Introversion refer to child temperament characteristics such as lack of emotional control and tendency to negative feelings, as well as low levels of activity and proneness to being alone.

Data on some family background variables, respectively information on mother and father's education, occupation and income *per capita,* were used to compute a socio-economic index[2], by ranking categories within each

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[2] This index was quite similar to the Hollingshead index for computing SES.

variable and attributing a numeric value to each one of them. These scores were added up to compute a numeric estimate of the socioeconomic status (SES) for each family (cf. Table 2). Families in which parents had more years of schooling, more specialized occupations and higher incomes received higher rankings.

*Procedure*

Each family was interviewed at home, the child being present and awake. A semi-structured interview was used to collect information needed to score the HOME. Information on child's temperament (EAS) and on adaptive behaviour (VABS) was collected using mothers as informants. Children were assessed by the interviewers on the PPVT-R.

**Results**

*Adequacy of the HOME Inventory*

Tetrachoric correlations among the items and the corresponding matrix were estimated using STATISTICA. A principal component analysis was performed, followed by a Varimax orthogonal rotation using an *eigenvalue* cut-off of 1.0. The factor analysis revealed six factors that explained 70.4% of the variance. The number of items included in each subscale and information regarding the original subscales where the items were drawn from is presented in Table 3.

The first factor accounted for the largest amount of the common variance (31%) and was named *Support for Development*. It drew from several previous subscales, namely Learning Materials, Language Stimulation, Variety of Experience and Physical Environment. Items relate to play materials and household equipment that characterize stimulating and challenging home environments, indicating the parents' ability to organise cultural experiences and to make them available to the child.

The second factor was named *Positive Interaction*. It focuses on parent-child interactions and accounted for 11.8% of the common variance. It included most of the observational items, particularly those that expressed a warm and positive affective relation with child. It corresponded closely to the subscale *Responsivity* and drew also some items from the original *Language Stimulation* subscale.

The third factor was responsible for 11.5% of the variance and most of the items reflected a deliberate effort from the parent to cognitively stimulate the child. It overlapped with the original *Academic Stimulation* scale and was named accordingly.

Table 3.   Subscales after factor analysis, internal consistency (Kuder-Richardson coefficients) and correspondence with original subscales.

| Subscales – Portuguese version | K-R (20) | N. of items in the Portuguese version | Items drawn from the following original subscales |
|---|---|---|---|
| 1. Support for development | .95 | 24 | 1. Learning Materials |
| | | | 2. Language Stimulation |
| | | | 7. Variety |
| | | | 3. Physical Environment |
| 2. Positive interaction | .87 | 9 | 4. Responsivity |
| | | | 2. Language Stimulation |
| 3. Academic stimulation | .83 | 8 | 5. Academic Stimulation |
| 4. Absence of hostility | .93 | 3 | 8. Acceptance |
| 5. Structure | .61 | 5 | Several |
| 6. Permissive discipline | .74 | 3 | 6. Modelling |
| HOME – total score | .94 | 52* | |

*Note:* * Three items were left out as they showed a negative correlation with the global score.

The remaining three factors and their correspondent subscales – *Absence of Hostility, Structure* and *Permissive Discipline*, appeared to be less robust in what concerns the percentage of variance they accounted for (6.8, 5.7 and 3.8%, respectively), although conceptually their meaning seemed quite relevant. The items included in the subscales *Absence of Hostility* and *Permissive discipline* indicated that the parent was able to model appropriate emotional control and that the child was not often punished or beaten for inappropriate behaviour. The items grouped under *Structure* reflected the existence of rules and routines in family organization.

*Internal consistency*

Given the fact that all the items in the HOME inventory are binary, internal consistency of the subscales and of the global scale was estimated using the Kuder-Richardson coefficients, (formula 20), as proposed by Almeida and Freire (1997). Values from the subscales ranged from a minimum value of 0,61 in the Structure subscale, to a maximum of 0,95 for the Support for Development subscale. The value obtained for the whole scale was 0,95. This value reveals good internal consistency and is similar to the

one obtained by the authors in their standardization study, in the U.S.A., which was 0,93.

*External validity*

With the purpose of determining the external validity of the inventory as a means of assessing quality of the family environment in Portuguese socio-cultural context, correlations between HOME scores and socio--economic status variables commonly considered as markers of the quality of home environment were calculated. Positive and significant correlations were found between the HOME scores and other markers of quality of the home environment, as shown in Table 4.

Table 4. Correlations between HOME Inventory (subscales and total score) and markers of quality of home environment for Portuguese families

| *HOME Subscales* | SES index[a] | Income per capita[b] | Crowding | Mother education[b] | Father education[b] |
|---|---|---|---|---|---|
| 1. Support for development | .72** | .57** | -.41** | .57** | .57** |
| 2. Positive interaction | .29** | .21** | -.24** | .24** | .24** |
| 3. Academic stimulation | .36** | .29** | -.15* | .22** | .25** |
| 4. Absence of hostility | .16* | .10 | -.10 | .14* | .14* |
| 5. Structure | .19** | .14* | -.25** | .15* | .09 |
| 6. Permissive discipline | .25** | .17** | .08 | .20** | .16** |
| *HOME total score* | .68** | .53** | -.41** | .52** | .52** |

*Note:* [b] Kendall' τ

* *p* < .05; ** *p* < .01

Correlations ranged from moderate to strong between HOME total score and the selected markers of quality of home environment, and between these and the Support for development subscale. Except in the case of sub-scale 3 – Absence of hostility and 6 – Permissive discipline, all correlations were statistically significant (*p* < .05).

*Relation between HOME scores and children's outcomes*

As mentioned before, this study also aimed to understand whether HOME scores were related to results obtained by the participating children

in the cognitive and adaptive behaviour domains, and, in the affirmative case, to determine the predictive power of HOME scores, compared to other relevant variables from the child's socio-ecological context.

Table 5 shows the correlations between HOME total and subscale scores and results obtained by children. The results include receptive vocabulary, assessed with the Peabody Picture Vocabulary Test (revised version), (PPVT-R), and adaptive behaviour, assessed with the Vineland Adaptive Behaviour Scales (VABS). Apart from the total score, domain scores on the VABS are also presented.

Table 5.  Correlations between HOME subscales and total scores with children's results on the PPVT–R and VABS (domain and global scores)

| HOME Subscales | PPVT-R | VABS Auton. | VABS Socialis. | VABS Com. | VABS Motor Dv. | VABS Global |
|---|---|---|---|---|---|---|
| 1. Support for dev. | .41*** | -.06 | .18** | .27*** | -.05 | .13 |
| 2. Positive interaction | .34*** | .11 | .20** | .29*** | -.12 | .20** |
| 3. Academic stimulation | .28*** | .18** | .25*** | .30*** | .07 | .28*** |
| 4. Absence of hostility | .02 | -.09 | .10 | -.02 | .05 | .00 |
| 5. Structure | .10 | .03 | .08 | .11 | .07 | .08 |
| 6. Permissive discipline | .16* | -.03 | .15* | .09 | -.14 | .05 |
| *HOME total score* | .44*** | .03 | .26*** | .34*** | -.05 | .22** |

*Note: * $p < .05$; **$p < .01$; ***$p < .001$*

Although the coefficients ranged from mild to moderate, there were some significant correlations between HOME scores and results from children, which were more evident in the cognitive domain, namely in Receptive Vocabulary and Communication. This last domain assesses language skills and knowledge and is therefore the most related with academic and cognitive development. No differences were found in the pattern of correlations for boys and girls.

Multiple regression analyses were performed on the data, using as criterion variables the results obtained by children in the cognitive test and in the adaptive behaviour scales. The HOME global score was used as an independent variable together with a set of other variables that included the four dimensions of temperament measured through the EAS, age and gender of child, the SES index and kindergarten attendance. The results for the Pea-

body Picture Vocabulary Test are presented in Table 6, followed by the results for the Vineland Scales in Table 7.

Table 6.   Multiple regression for vocabulary test scores (PPVT-R) using child's
          variables and variables from the ecological context as predictors

| *Predictors* | *β* | *t* | *sr²* | *R²* | *F(9, 205)* |
|---|---|---|---|---|---|
| Energy (EAS) | -.051 | -.739 | .00 | .220 | 6.413*** |
| Sociability (EAS) | .089 | 1.321 | .01 | | |
| Emotionality (EAS) | -.003 | -.041 | .00 | | |
| Introversion (EAS) | .012 | .184 | .00 | | |
| Age | -.061 | -.978 | .00 | | |
| Gender (0=fem; 1=masc) | -.067 | -1.074 | .01 | | |
| SES | . 141 | 1.555 | .01 | | |
| Kindergarten attendance | -.006 | -.095 | .00 | | |
| HOME global score | .336 | 3.938*** | .07 | | |

*Note:$^+$p < .10;  * p < .05;  **p < .01;  ***p < .001*

Table 7.   Multiple regression for adaptive behaviour (VABS) scores using child's
          variables and variables from the ecological context as predictors

| *Predictors* | *β* | *t* | *sr²* | *R²* | *F(9,198)* |
|---|---|---|---|---|---|
| Energy (EAS) | .101 | 1.440 | .01 | .234 | 6.708*** |
| Sociability (EAS) | .230 | 3.375** | .05 | | |
| Emocionality (EAS) | -.088 | -1.346 | .01 | | |
| Introversion (EAS) | .100 | 1.512 | .01 | | |
| Age | .293 | 4.636*** | .10 | | |
| Gender (0=fem; 1=masc) | -.179 | -2.838** | .04 | | |
| SES | -.002 | -.064 | .00 | | |
| Kindergarten attendance | -.084 | -1.256 | *.01* | | |
| HOME global score | .253 | 2.944** | *.04* | | |

*Note: $^+$p < .10; * p < .05; **p < .01; ***p < .001*

HOME score was the only significant predictor when children's results in the Receptive Vocabulary test (PPVT-R) were used as a dependent variable. Children from higher quality home environments had higher results on the vocabulary test.

Age, sociability, HOME score and gender were significant predictors of the results obtained by children in the adaptive behaviour scales. Older children, girls, more sociable children and those with higher HOME scores, were also the ones with higher adaptive behaviour scores.

### Conclusions

This study confirmed the validity and the relevance of the Early Childhood HOME as a measure of the quality of the home environment of Portuguese families with preschool aged children.

The psychometric properties of the scale were analysed in the participant group and considered to be quite satisfactory. Although a different factor structure emerged and in spite of the reduction in the number of subscales, the new structure presents conceptual consistency. The three main subscales, namely *Support for Development, Positive Interaction* and *Academic Stimulation*, reflect three basic dimensions of quality of family environment: physical/spatial, socio-emotional and cognitive/academic. A similar reduction in the number of subscales was found in other studies conducted with families from different socio-economic, cultural and ethnic backgrounds, particularly with Latin families (Bradley, Mundfrom, Whiteside, Casey *et al.*, 1994) and led some authors to refer only to global scores and to ignore scores on subscales (Palacios, Lera & Moreno, 1994). Until further research is conducted that may clarify the reasons for the differences that were found, the idea of referring only to the HOME global score in forthcoming studies with the HOME inventory seems wise. The internal consistency values found for the subscales and for the whole scale confirm the relevance of the instrument for the evaluation of quality of environment in Portuguese homes.

The correlations shown in Table 4 reflect the association between quality of home environment and variables related with socio-economic status of the family, normally assumed to be markers of the quality of the educational and developmental context of children. Parents with more years of schooling and with more demanding jobs seemed more able to develop higher quality environments. Higher HOME scores were also related with higher income *per capita*, and lower crowding ratios. Such data further confirm the validity of the HOME inventory for the Portuguese families and the Portuguese socio-cultural context.

HOME global score was found to be a more powerful predictor of child development status than any other variable of the child's socio--ecological context included in this study. This conclusion is particularly relevant if we bear in mind that a strong socio-economical indicator was included in the regression model, which aggregated information on family background variables such as mother and father levels of schooling, occupation and income. The fact that this indicator revealed no predictive power may be interpreted as an evidence that, in spite of their strong correlation with HOME scores, the two variables are actually tapping distinct aspects of the child's ecological and developmental *niches*.

The HOME global score was the only significant predictor of the results in the receptive vocabulary test, which stresses the idea that quality of home environment has a direct influence in the cognitive development of children. The picture is somewhat different when adaptive behaviour is the dependent variable, although HOME scores still remain the most significant predictor. When results are measured in areas other than the cognitive, child variables like age, gender and temperament seem to play a part, together with the quality of home environment.

Adaptation or adaptive functioning in human beings is more than merely reacting to stimuli so as to ensure survival, but includes using the environment to take advantage of its possibilities (Bradley & Caldwell, 1995). In this sense, environment and individual transact, and transform each other. This transactional viewpoint is particularly appropriate to account for the way in which individual and home environment variables seem to work together in the determination of adaptive behaviour results, like it was found in this study. Such a relation applies to the findings in the adaptive behaviour domain, where variables from the environment and variables at the individual level are both responsible for the results. Further studies will be needed to fully understand the complex processes and transactions that may underlie the relations that were found in this study.

As a last remark, we stress the relevance of this instrument not only for research purposes, but also as a tool that may help to differentiate families and children at risk, among those that live in deprived areas or low socio-economic conditions. The HOME scores have shown little variability in families from high socioeconomic status, but considerably high variability was found in the HOME scores of more economically deprived families. Hopefully, not all children that live in poverty are doomed to developmental problems. In spite of considerable overlapping between the socio--economical status index and HOME scores, the HOME score is tapping structures and processes which may have a direct and much stronger impact on child development. If this is so, then HOME Inventory can play an important role in the evaluation and intervention in families and children at risk.

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