

Validation of Home Screening Questionnaire (HSQ) against Home Observation for the Measurement of Environment (HOME)

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This study was done to validate the screening tool 'Home Screening Questionnaire (HSQ)' against the gold standard 'Home Observation for the Measurement of Environment (HOME)' inventory, using diagnostic test evaluation. Both HOME inventory and HSQ were administered by separate observers, with children less than 3 years of age, among 200 families belonging to 14 anganwadi areas. There was a high sensitivity of 83 and a high specificity of 82 observed for a cutoff point of 'less than or equal to' 19 on HSQ against HOME Inventory as Gold Standard, as was also observed in the Receiver Operating Characteristic (ROC) curve. The likelihood ratio (LR) for positive test was 4.6 (95% CI, 3.3 to 6.9) which implies that the families with poor home environment are 4.6 times more likely to have the HSQ score 'less than or equal to' 19 as compared to normal families. The results of this study imply that we can confidently apply the HSQ in developmental evaluation clinics and reserve HOME inventory for research purposes.

Keywords: *Home environment, Home inventory, India, Validation.*

Developmental research has shown that the home environment may serve as a protective factor for children(1). Home environment scores were found to be significantly related to mental development, independent of parental education and occupation(2). It is suggested that early social environment plays a role in mediating establishment of neural networks that regulate a child's response to stress and capacity for self-control(3). The quality of mother infant interaction and the presence of age appropriate play materials may be used as a surrogate for the evaluation of quantity and quality of stimulation available at home. Healthy brain development depend upon the care and support provided by individuals in the community as well as in the family(4).

The Home Screening Questionnaire (HSQ) serves as a quick, simple and economical parent-

answered questionnaire for evaluating the quality of the family environment promoting child development(5). The advantage of HSQ is that it can be used in routine clinical situations. It can also be used by health, daycare and social services personnel, in place of the Home Observation for the Measurement of Environment (HOME) inventory, which requires time consuming home visits and direct observations(6). The present study was done to validate the screening tool Home Screening Questionnaire (HSQ) against Home Observation for the Measurement of Environment (HOME) inventory, using diagnostic test evaluation.

METHODS

The screening tool HSQ and the gold standard HOME inventory were administered by separate observers, among families with children less than 3 years of age, belonging to 14 anganwadi areas

TABLE I VALIDITY STATISTICS FOR ‘RULING IN’ AND ‘RULING OUT’ CUTOFF POINTS OF HSQ

	HSQ score	Sensitivity	95% CI	Specificity	95% CI	*LR+	95% CI	Post test probability
Rule out ‘abnormal’ family	≤21	96	93.2 - 98.7	62	55.2 - 68.7	2.5	2.1 - 3.2	0.73
	≤20	91	87 - 94.9	74	67.9 - 80	3.5	2.7 - 4.7	0.79
Rule in ‘abnormal’ family	≤19	83	77.7 - 88.2	82	76.6 - 87.3	4.6	3.3 - 6.9	0.84
	≤18	68	61.5 - 74.4	90	85.8 - 94.1	6.8	4.3 - 12.7	0.88
	≤17	52	45 - 58.9	96	93.2 - 98.7	13	6.7 - 45.8	0.93

*LR+: Likelihood ratio for positive test

randomly selected from an ICDS block in Thiruvananthapuram district. The sensitivity was assumed to be around 80% and in order to estimate the sample size with the precision of 5.5%, with 95% confidence interval, we needed to study 203 families.

HOME inventory, designed for use with families of infants and toddlers contains 45 items and it has 6 domains, viz; emotional and verbal responsiveness of parent, acceptance of child’s behaviour, organization of physical and temporal environment, provision of appropriate play materials, parent involvement with child, and opportunities for variety in daily stimulation. A single score is given to each item and the total score is obtained by adding up the scores. As per the HOME inventory manual, a cutoff score of less than or equal to 24 is abnormal (poor home environment) and above 24 normal (good home environment).

HSQ (0-3 years) is a parent–answered questionnaire which is written at a 3rd or 4th grade reading level. It consists of 30 items; multiple choice, fill in the blanks, yes/no questions plus a toy inventory checklist. As there is no specific cutoff score given for denoting a poor home environment in HSQ, the same was obtained using the following method. At each cutoff point of the HSQ scale scores, the sensitivity, specificity and likelihood ratio of the positive test were calculated. Receiver operating characteristics (ROC) curve was drawn to identify the best cutoff point for the HSQ scale. The point which is closer to the top and left most corner of the ROC curve was chosen as the best cutoff point. Also the likelihood ratio of the positive test and its 95% confidence interval and post test probability of being abnormal

were calculated. The sensitivity, specificity, accuracy and predictive values for the chosen cutoff point of HSQ as compared to the HOME scale were computed.

RESULTS

There were 201 eligible families in the study area and data was available for 200 families as one family refused permission. Sensitivity, specificity and likelihood ratios for different scores of HSQ against HOME inventory were calculated. A sensitivity of 83 and a specificity of 82 was observed for a cutoff point of ≤19 on HSQ (**Fig. 1**), as also observed in the ROC curve.

Table I shows that the likelihood ratio (LR) for positive test was 4.6 (95% CI, 3.3-6.9), which implies that the families with poor home environment were 4.6 times more likely to have the

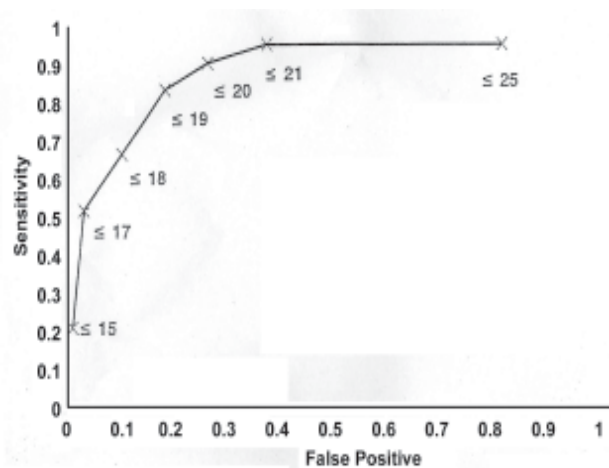


FIG. 1 ROC curve for Home Screening Questionnaire.

WHAT THIS STUDY ADDS?

- HSQ against HOME inventory has a high sensitivity (83%) and specificity (82%) observed for a cutoff point of ≤ 19 on HSQ.
- Families with poor home environment are 4.6 times more likely to have HSQ score ≤ 19 as compared to normal families.

HSQ score ≤ 19 as compared to normal families. Therefore this point was considered to 'rule in' abnormality. The posttest probability of being abnormal family, if score is ≤ 19 is 0.84. According to the HOME inventory, 103 families out of 200 were diagnosed to have poor home environment. It was also observed that for the screening test HSQ against the gold standard HOME inventory, the sensitivity was 83%, specificity 82%, positive predictive value 83.3%, negative predictive value 81.6%, and accuracy 82.5%. Both the HSQ and HOME inventory identified 85 families as of poor environmental status (true positive) and 80 families as of good environmental status (true negative).

DISCUSSION

A screening test should ideally be one with high sensitivity and specificity but in practical situations, we usually go for high sensitivity for screening test and high specificity for the confirmatory test. But a tradeoff between sensitivity and specificity becomes often necessary. In this study, the best cutoff point taken for HSQ score was less than or equal to 19, because it offered an acceptably high sensitivity of 83% and a high specificity of 82%.

The observed high negative predictive value of 81.6% indicates that with a negative test result, it is very unlikely that the home is abnormal (poor home environment), a welcome quality for a screening test. This result implies that we could apply with confidence the HSQ in developmental evaluation clinics and reserve HOME inventory for research purposes. The HOME inventory requires that a trained interviewer visit the home to complete it, which is both costly and time consuming. The advantage of HSQ is that it may be completed by a parent or health worker. Similar observations have also been made in validation studies done in other populations(7-9).

It is also recommended that whenever we do developmental assessment, home environment assessment, an important factor determining the developmental outcome, should be included.

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