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ABSTRACT

An item analysis of Harris' scoring system for the Goodenough-Harris Draw-A-Man Test was conducted by comparing sets of protocols obtained in the early fall of kindergarten from children whose overall in-class academic performance placed them either in an at-risk category (N=21) or at the top of their class (N=38) by the end of the school year. The outcome showed that three items in Harris' system (item #9 - nose; item #30 - arm; item #46 - trunk) differentiated these two extreme groups and that by confining the scoring of additional protocols of the Draw-A-Man Test to these three items alone, an improvement over Harris' 73-item scale in predicting school achievement was obtained. However, since further evidence indicated that these three key items lose their predictive potential by the end of the kindergarten, it is strongly recommended that the use of this greatly abbreviated scoring system be limited to drawings made near the start of the kindergarten year. (Author)

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Abstract

An item analysis of Harris' scoring system for the Goodenough-Harris Draw-A-Man Test was conducted by comparing sets of protocols obtained in the early fall of kindergarten from children whose overall in-class academic performance placed them either in an at-risk category (N = 21) or at the top of their class (N = 38) by the end of the school year. The outcome showed that three items in Harris' system (item #9 - nose; item #30 - arms; item #46 - trunk) differentiated these two extreme groups and that by confining the scoring of additional protocols of the Draw-A-Man Test to these three items alone we were able to obtain an improvement over Harris' 73-item scale in predicting school achievement. However, since further evidence indicated that these three key items lose their predictive potential by the end of kindergarten, we strongly recommend that the use of this greatly abbreviated scoring system be limited to drawings made near the start of the kindergarten year.

TM 840 002

Improving the Predictive Validity of the Draw-A-Man Test as a Screening Device for School Readiness

In a recent review Scott (1981) summarized a number of investigations showing that scores obtained from five year old children on the Goodenough-Harris Draw-A-Man Test (Harris 1963) only produce low order correlations with subsequent academic achievement. Because of these findings she concluded, in agreement with many others (e.g., Duffey, Ritter, & Fedner 1976), that the Draw-A-Man Test has little practical utility as a predictor of school performance. This of course suggests that either the test itself, as a school readiness instrument, should be discarded, or if used, it should be employed with considerable caution by practitioners when making recommendations concerning a child's academic potential.

Before acting on either suggestion, however, it is important to keep in mind that, in a sense, the results reported by Scott are not surprising since the theoretical basis for the scoring system originally developed by Goodenougn and subsequently expanded by Harris is now known to be inaccurate (Coletta 1973; Golomb 1973; Nash 1973). Of far greater importance though, the outcome of the present investigation shows that by altering this scoring system and using instead an empirically derived subset of items based on an item analysis applied to Harris' scale, an improvement over Harris' scoring procedure in predicting school readiness can be obtained. Moreover, through use of this alternative scoring system, we found that the overall predictive validity of the Goodenough-Harris Draw-A-Man Test equals, and in some instances even exceeds, that achieved with many other commonly used, yet far more time consuming, school readiness tests. Hence, the purpose of this report is to suggest that rather than discard the Draw-A-Man Test and its many variations that now appear on a number of other early screening devices (e.g., the Stanford-Binet Intelligence Scale, the McCarthy Scales of Children's Abilities, the Koppitz Human Figure Drawing Test, the Evanston Early Identification Scale, the Gesell Incomplete Man Test, the Vane Kindergarten Test, the First Grade Screening Test, and the Denver Developmental Test), if scoring is confined to certain key items in the Harris system, human figure drawings still hold considerable promise as aids in identifying five year old children who are at risk for school failure.

Method

Subjects: One hundred and eighteen non-repeating children (61 male, 57 female) were tested in the early fall of kindergarten (mean age = 62.9 months). All of the children were fluent in English and were obtained from five public elementary schools serving lower and middle income areas in a medium size urban centre (population: 258,000).

Procedure: Each child was asked to draw a picture of a man on a single sheet of white unlined paper (21.5 cm x 27.5 cm) using the following instructions from Harris: "I want you to make a picture of a man. Make the very best picture that you can; take your time and work very carefully. Be sure to make the whole man, not just the head." In addition, every time the children paused for more than 3-5 seconds, they were asked: "Is there anything else that you want to put on your man, or are you all done?" When the children indicated they were finished, the paper was removed and they were praised for the completed drawing. Each drawing was then scored using the entire 73-item point scale in the

Harris scoring system. Employing the procedures outlined by Harris in the test manual, the children received one point for each item present in their drawings.

As an index of academic achievement, each child's class standing was obtained from the end of kindergarten promotion lists prepared by the children's teachers using a 12 point rating scale ranging from D- to A+. These ratings were based largely on individually administered assessments of the children made by the teachers employing either a modified version of the Criterion-Referenced Measurement Program in Reading and Mathematics (Alkin 1976) or items from the Metropolitan Readiness Tests (Hildreth, Griffiths & McGauvran 1969). The promotion lists also contained the names of the "at-risk" children. These were the children who failed, were being promoted to a slower or junior section of the next grade, or were said to be in need of some form of special academic assistance. For the most part, this latter group consisted of children who received D- to D+ ratings. It should be noted that selection of these promotion lists as the major criterion measure was predicated on well established findings which show that the factors contributing to the global judgements reflected on these lists are among the best single indicators of future academic success in the early primary grades that are available at the present time (Cowgill, Friedland, Shapiro 1973; Dibner & Korn 1969; Mercer, Algozzine, & Trifiletti 1979; Serwer, Shapiro, & Shapiro 1972; Stevenson, Parker, Wilkinson, Hegion, & Fish 1976a).

Results

Because the data involved frequency counts, that is, the number of children whose drawings contained a particular item, first a series of chi-square tests were employed to determine whether any of the items in Harris' scoring system differentiated the drawings made by the children in the at-risk group (N = 21) from the drawings made by the children who received A-, A, or A+ ratings and therefore, were at the top of the fully ready group (N = 38). To reduce the possibility of obtaining reliable differences through the operation of chance factors alone -- which is indeed likely if all 73 of the potential ad-hoc comparisons were made -- these analyses were restricted to those items that (1) typically occur in drawings produced by children in the five year old age group, and (2) reflect the omission of body parts since items of this nature are now known to have far more diagnostic potential than items concerned with structural or content characteristics (Goldman & Velasco 1980). With these considerations in mind the following seven items were selected since, according to Harris' own data, each of these items is present in at least 70% of the drawings made by children in this age group: item #1 - head, item #4 - eyes, item #9 - nose, item #11 - mouth, item #30 - arms, item #35 - legs, and item #46 - trunk.

The outcome of the seven separate chi-square analyses showed that three items differentiated the drawings made by the children at these two extreme ends of this achievement continuum. Specifically, item #9, - nose ($X^2 = 7.14$, df = 1, $p < .01$), item #30 - arms ($X^2 = 6.19$, df = 1, $p < .02$), and item #46 - trunk ($X^2 = 11.71$, df = 1, $p < .001$) were far more likely to be <u>absent</u> from the drawings made by the children in the at-risk group than from the drawings produced by the children at the top of the fully ready group.

Next we asked whether the overall score obtained from these three items alone related to the children's achievement when the drawings from the entire sample of 118 children were now taken into consideration and, if so, was the obtained correlation an improvement over that generated when these same 118 drawings were scored according to the procedure employed by Harris using his more elaborate 73-item scoring system? The results showed, first, that the product-moment correlation between the childrens' total score on items #9, #30, and #46 with the end-of-year school achievement ratings provided by the children's teachers was -.43 (df = 116, $p < .001$). This, of course, is quite similar to the correlations obtained between subsequent academic achievement and performance on such kindergarten administered "readiness" tests as the Peabody Picture Vocabulary test, the Wechsler Preschool and Primary Scale of Intelligence, the Otis-Lennon Group Intelligence test, and the Lorge-Thorndike Intelligence test, to mention just a few (Feshback, Adelman, & Fuller 1974; Mendels 1973; Serwer, Shapiro, & Shapiro 1972; Stevenson, Parker, Wilkinson, Hegion, & Fish 1976b). Second, this correlation of -.43 was also greater than the correlation obtained using the Harris scoring system (-.34). It is also worth noting that this lower level correlation of .34 produced by the Harris method, is quite similar to those correlations reported in the various investigations reviewed by Scott (1981). Hence, these findings indicate that by restricting the Harris scoring system to this subset of three items, rather than employing Harris' far more detailed and time consuming 73-item scale, the correlational validity of the Draw-A-Man Test can be improved to a degree that makes the outcome of this test equivalent to the outcome obtained with many other early screening devices.

A more meaningful way of expressing the relationship we found between the total score on these three items alone and the children's end-of-year class standing, however, is in terms of predictive efficiency or classification hit rate (Lichtenstein 1981). In other words, how many individual children are likely to be judged correctly as being at-risk for failure if such judgements are made prior to the end of kindergarten on the basis of knowing the children's overall score obtained from these items alone? To answer this question we selected a total score of 2 or more as a cutoff point. That is to say, children who achieved a total score of either 0 or 1 when their drawings were scored for the presence of items #9, #30, and #46 were said to be at-risk for failure while those obtaining an overall score of either 2 or 3 based on these same three items were judged ready for school entry. Table 1 shows the total number of children from the entire sample of 118, separated into the four end-of-year promotion rating categories (i.e., A, B, C, D) according to whether or not the children's total score reached this cutoff point.

As the data in Table 1 indicate, the overall hit rate (true positive + true negative/total number of children for whom predictions were made) associated with this cutoff score of 2 was 85%. Here then the results not only equal but even exceed in many instances, the results obtained from a number of other widely used school readiness devices (Mercer, Algozzine, Trifiletti 1979; Simner 1982a). Stated somewhat differently, as can be seen in Table 1, it was rare indeed to find drawings of a man produced by children in either the fully ready category (those receiving B-, B, or B+ ratings) or in the top of the fully ready gory (those receiving A-, A, or A+ ratings) that failed to contain at least two, if not all three, of these particular items. On the other hand, 67% of the drawings obtained from the children in the at-risk category lacked either two, and in many instances, all three of these same items.

Place Table 1 About Here

Before recommending the adoption of this greatly abbreviated scoring system in place of Harris' system when using the Draw-A-Man test to screen for school readiness, however, we need to be certain that these findings can be replicated. That is, can we obtain similar results when drawings produced by a new sample of children are scored for these three items alone? Also, we must demonstrate that two independent judges exhibit a high level of agreement when asked to rate the drawings of five year old children for the presence of items #9, #30, and #46. Without such evidence of inter-judge reliability there is a good possibility that some children might fail to acl this suggested school readiness cutoff point, not because their drawings actually lack two or more of these three key items, but simply because it is difficult to determine whether children's drawings do in fact contain these particular items. Yule, Lockyer, and Noone (1967), for example, have shown that judges find it difficult to recognize the presence of at least some items in Harris' scoring system when asked to evaluate drawings produced by 10 year old children. Finally, if this proposed system is to be employed in place of Harris', the total score obtained from these three items should remain at least as stable over time as the total score generated when Harris' system is used.

First, to determine if our original findings are replicable, a new sample of 50 non-repeating children (25 male, 25 female), drawn from three of the schools mentioned above, was tested in the late spring of pre-kindergarten (Mean age = 60 months) using the procedures described previously. As an index of academic achievement, we obtained the class standing of each child in this new sample from the promotion lists prepaired by the children's teachers at the end of pre-kindergarten. This same promotion list information was also obtained for 39 of the children in this sample the following year when these 39 children reached the end of kindergarten.

In agreement with our previous results we found a product-moment correlation of -.50 (df = 48, $p < .001$) between the children's total score on items #9, #30, and #46 alone and the class standing information that appeared on the end of pre-kindergarten promotion lists. Also, the correlation between these same two variables but now using the data contained on the end of kindergarten promotion lists was -.51 (df = 37, $p < .001$). Moreover, in both instances these new correlations exceeded the product moment correlations obtained between this class standing information and the Draw-A-Man scores obtained with the Harris' method of scoring (end of pre-kindergarten: -.21; end of kindergarten: -.30).

As for the reliability of the cutoff point used above, the 39 individual children for whom end of kindergarten promotion list information was available, were separated into the same four promotion categories discussed before, based on whether or not these children obtained a total score of 2 or more on items #9, #30, and #46. These data appear in Table 2. Comparing Table 2 with Table 1 clearly illustrates the marked similarity between these two independently obtained sets of findings.

Place Table 2 About Here

In fact, as additional evidence in support of the overall reliability of these results, we also found that the total score generated by these three items alone related to performance on two school readiness tests which themselves are known to predict later academic achievement, as well as on the Wide Range Achievement Test (Jastak & Jastak, 1976). Employing yet a further sample of 132 non-repeating children (66 male, 66 female) tested in October-November of kindergarten, the Draw-A-Man Test was given together, first, with the alphabet knowledge subtest, the number knowledge subtest, and the relational concept subtest, from Lesiak's (1978) Developmental Tasks for Kindergarten Readiness and, second, with Simner's (1982b) Printing Performance School Readiness Test. These particular tests were selected because the findings reported by both Lesiak and Simner show that kindergarten children's scores on these tests correlate in the neighborhood of .50 to .60 with later performance in grade 1. The Wide Range Achievement Test was administered to 114 of these children approximately three months later in January-February of kindergarten.

The outcome of this further work produced product-moment correlations of .57 ($p < .001$), .52 ($p < .001$), and .53 ($p < .001$), respectively, between the children's total score on items #9, #30, and #46 in Harris' scale and the total scores achieved on the three subtests from the Developmental Tasks for Kindergarten Readiness. Similarly, correlations of .67 ($p < .001$) and .72 ($p < .001$) were obtained between the composite score on these three items alone and the children's performance on the Printing Performance School Readiness Test and on the Wide Range Achievement Test, respectively. Of added importance, 22 (76%) of the 29 children in this further sample of 132 children who did not reach our suggested cutoff point of 2 when given the Draw-A-Man Test, obtained error scores that ranged from 22 to 41 on the Printing Performance School Readiness Test. According to the manual that accompanies this test, for children who obtain error scores in this range, the odds of being at the bottom of the class instead of being at the top of the class by the end of the school year, are approximately 9 to 1. This by itself, of course, emphasizes the serious potential consequence for kindergarten children whose fall drawings of a man lack some combination of a nose, arms, or trunk. Moreover, Table 3 which illustrates the overall predictive efficiency of this cutoff point in connection with the results obtained from the 114 children given the Wide Range Achievement Test, shows a classification hit rate of 88%. On the whole then, the level of agreement between our original results and the findings from these new samples of pre-kindergarten and kindergarten children, clearly demonstrates that this abbreviated method for scoring the Draw-A-Man Test does indeed yield results that are replicable.

Place Table 3 About Here

Next, to obtain information on inter-judge reliability, 39 drawings selected at random from the drawings produced by the children tested in the fall of kindergarten, were scored independently by two judges. The evidence here showed that both judges agreed on the presence of the nose in 97% of the cases, the presence of both arms in 100% of the cases, and on the presence of the trunk in 97% of the cases. Hence, it would seem quite unlikely that the total score assigned to any given five year old child's drawing would vary because of difficulties that judges have when asked to identify these particular items.

Third, to gather information on the stability of this scoring system in relation to Harris' scoring system, the Draw-A-Man Test was given twice to a sample of 24 children approximately 3-4 months apart. This sample included 18 of the previously mentioned pre-kindergarten children who were tested a second time in the fall of kindergarten along with six additional children initially tested in November-December of kindergarten then once again in January-February of kindergarten. The outcome of this further work produced a test-retest product-moment correlation of .63 (df = 22, $p < .001$) on the total score generated by items #9, #30, and #46 alone, and a correlation of .59 (df = 22, $p < .002$) when all 73 items in Harris' scoring system were used. Both of these correlations closely approximate the test re-test correlations reported by Harris himself (1963, pg 91) over a very similar time interval.

Finally, it is worth noting that despite an impression conveyed by these results, we were unable to find any particular drawing type associated with the drawings produced by the at-risk child. That is to say, since the drawings made by these children lacked some combination of a nose, arms, or trunk, it seemed reasonable to expect that many of the reproductions might have resembled some form of incomplete tadpole figure (i.e. , , ) which is so often seen among drawings made by children younger than five years old (Freeman 1980). This expectation follows from the logic underlying at least part of the rationale for the Draw-A-Man Test itself where it is assumed that children who are intellectually less mature should produce drawings which themselves reflect a lower level of maturity (Harris, pg. 111). Contrary to this expectation, however, of the 31 drawings obtained from all of the true-positive children in the present sample (see Tables 1, 2, and 3), only nine resembled an incomplete tadpole. The rest contained a range of characteristics that prevented any meaningful grouping into the various drawing "stages" associated with the younger child's rendition of a man as reported by Kellog (1970). Hence, there seems little reason for believing that by focusing on some global characteristic of these drawings, such as their overall maturity level as Harris suggests, the practitioner will improve upon the degree of information regarding school readiness that is already available by simply noting whether or not a five year old child's drawing lacks some combination of a nose, arms, or trunk.

Discussion

The major findings from this investigation show that if we confine the scoring of the Draw-A-Man Test to items #9, #30, and #46 in Harris' system, this test has the same overall potential for correctly identifying at-risk children as many far more time consuming instruments that are currently being used for screening purposes.[1] This is not to suggest, however, that the Draw-A-Man Test, even with this improved scoring system, should be used as the sole means of determing a child's readiness for school entry. In spite of the relatively high predictive efficiency that we were able to achieve, Table 1 also shows that the total number of false positive judgements (N = 11) is nearly equal to the total number of true positive judgements (N = 14). Similar evidence can be seen in the results reported in Tables 2 and 3. Therefore, this test still needs to be employed together with other information if we are to minimize the likelihood of mislabeling any given child as being at-risk for failure when in fact, that child is not at-risk for failure.

It is worth pointing out though that if, through further testing confined to the group of true and false positives alone, it is possible to reduce the number of false positives without greatly affecting the number of true positives, the Draw-A-Man Test might prove extremely useful as an aid in the development of a reasonably cost effective early identification program. For instance, in the case of our original kindergarten sample, instead of using say, the De Hirsch Predictive Index or the Gates-MacGinitie Reading Readiness Test to screen all 118 children, had the Draw-A-Man Test been given first for general screening purposes, it would only have been necessary to administer these more extensive tests to 25 children (the total number of true and false positives identified by the Draw-A-Man Test as shown in Table 1). This is the case since 67% of all of the at-risk children in this entire sample of 118 children can be found among these 25 children and, furthermore, most of the remaining at-risk who were not detected with the Draw-A-Man Test (the false negatives shown in Table 1), probably would not have been identified by these other tests either since a false negative rate of approximately 20-30% seems typical of the majority of single as well as multivariable instruments in use today (Mercer, et. al. 1979). In other words, by employing the Draw-A-Man Test as a first stage in a general screening program followed by further testing with more specialized instruments given to those few children whose drawings do not achieve a total score of 2 or more using our abbreviated scoring system, it should be possible to reduce the amount of time needed for the entire screening process without compromising the accuracy of the screening program itself.

There is one final matter that also needs to be mentioned. Because of the changes in children's drawings that normally take place over time it is quite possible that our three item scale might not yield valid information about subsequent school achievement if it is used to score drawings that are obtained later in the kindergarten year. Indeed, when we re-tested 13 of the 14 true positive children from our original kindergarten sample (see Table 1) when these children reached the end of the kindergarten year, we found that these three critical items were now present far more often than before ($t(12) = 8.1$, $p < .001$). In fact, due to this increase, 12 (92%) of these 13 children now received scores on our scale that placed them above the cutoff point that we had used earlier with such success. Moreover, based on yet another set of drawings made by 109 children tested in May-June of kindergarten, we found that the product-moment correlation between the children's total score on items #9, #30, and #46 and their end of kindergarten class standing had fallen to -.17 (recall that we had previously obtained correlations in the neighborhood of .40 to .50 using drawings produced near the start of kindergarten). Although this spring correlation of .17 was still statistically reliable ($p < .04$), the magnitude of the association that it describes is far too low, of course, to serve any practical purpose. Parenthetically, the item analysis that we had used earlier to identify these three key items, when now applied to this new set of spring drawings, failed to uncover any other items that could be used to improve the equally low level correlation of -.19 which we obtained with Harris' 73-item scale applied to this same set of spring drawings.

Thus, while the major findings from the present investigation point to the advantage that can be had by using this greatly abbreviated three item scale in place of Harris' far lengthier 73-item scale, these additional data suggest that two equally important conclusions are also in order. First, because of the changes that normally take place in children's drawings during the course of the kindergarten year, the use of this abbreviated scale should be confined to human figure drawings produced near the start of kindergarten since the predictive accuracy of this scale diminishes after this period of time. Second, since neither Harris' original scale, nor our own abbreviated version of this scale, nor even our further work with Harris' scale, allowed us to obtain acceptable correlations with academic achievement when these various scales were applied to drawings produced later in the kindergarten year, it would seem advisable to heed Scott's (1981) warning and not use the Draw-A-Man Test at all in judging children's academic potential, if this test is to be given much later than the fall semester of kindergarten. In line with this point, Powers (1974) also reported a decrease with age in the predictive validity of the Draw-A-Man component of the Vane Kindergarten Test between the end of pre-kindergarten and the end of kindergarten. Hence, if the need to screen older children does arise, other equally rapid devices like the Printing Performance School Readiness Test mentioned above, which has valid cutoff points geared to both younger as well as older preschool children, would be far more appropriate.

Table 1. Prediction of kindergarten children's placement in the four end of kindergarten promotion categories based on the children's total score derived from items #9, #30, and #46 alone in Harris' scoring system for the Draw-A-Man Test. The cells contain both the number and percentage (in brackets) of children tested in the fall of kindergarten (N = 118) for whom either true or false positive as well as true or false negative judgements occurred.

	End of Kindergarten Promotion Categories			
	D-, D, D+	C-, C, C+	B-, B, B+	A-, A, A+
Draw-A-Man Test	(at-risk for failure)	(average readiness)	(fully ready)	(top fully ready)
Poor prognosis (score of 0 or 1)	(true positive)	(false positive)	(false positive)	(false positive)
	14	6	2	3
	(67%)	(21%)	(7%)	(8%)
Good prognosis (score of 2 or 3)	(false negative)	(true negative)	(true negative)	(true negative)
	7	23	28	35
	(33%)	(79%)	(93%)	(92%)
Total	21	29	30	38

Table 2. Prediction of pre-kindergarten children's placement, one year later, in the four end of kindergarten promotion categories based on the children's total score on items #9, #30, and #46 alone in Harris' scoring system for the Draw-A-Man Test. The cells contain both the number and percentage (in brackets) of children tested in the spring of pre-kindergarten (N = 39) for whom either true or false positive as well as true or false negative judgements occurred.

	End of Kindergarten Promotion Categories			
	D-, D, D+	C-, C, C+	B-, B, B+	A-, A, A+
Draw-A-Man Test	(at-risk for failure)	(average readiness)	(fully ready)	(top fully ready)
Poor prognosis (score of 0 or 1)	(true positive)	(false positive)	(false positive)	(false positive)
	7	3	4	0
	(70%)	(30%)	(29%)	(0%)
Good prognosis (score of 2 or 3)	(false negative)	(true negative)	(true negative)	(true negative)
	3	7	10	5
	(30%)	(70%)	(71%)	(100%)
Total	10	10	14	5

Table 3. Prediction of kindergarten children's placement in the classification categories on the Wide Range Achievement Test as a function of the children's total score on items #9, #30, and #46 alone in Harris' scoring system for the Draw-A-Man Test. The cells contain both the number and percentage (in brackets) of children tested in the fall of kindergarten (N = 114) for whom either true or false positive as well as true or false negative judgements occurred.

	Classification Categories on the Wide Range Achievement Test			
	Defective to Low Average	Average		High Average to Very Superior
	(Standard Score: 90 or less)	(Standard Score: 91 - 99)	(Standard Score: 100 - 109)	(Standard Score: 110 or more)
Draw-A-Man Test				
Poor Prognosis (score of 0 or 1)	(true positive) 10 (83%)	(false positive) 9 (38%)	(false positive) 3 (6%)	(false positive) 0 (0%)
Good Prognosis (score of 2 or 3)	(false negative) 2 (17%)	(true negative) 15 (62%)	(true negative) 50 (94%)	(true negative) 25 (100%)
TOTAL	12	24	53	25

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Footnote

[1] For a provocative discussion of the theoretical implications of the absence of these particular features see Freeman (1980).

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