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CONVERGENT-DIVERGENT THINKING ABILITIES AND RISK-TAKING IN CHILDREN[1]

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This study investigated the relationship of convergent and divergent thinking to risk-taking and anxiety. Two major hypotheses were tested: (1) a negative relationship of risk-taking to convergent and (2) a positive relationship of risk-taking to divergent thinking. One hundred thirteen sixth grade Filipino boys took the Kuhlmann-Anderson Test (Form D) for convergent thinking and the Torrance Tests of Creative Thinking for divergent thinking. Three activities (Ring Toss, Clues, and Fortune Wheel) were employed to assess risk-taking. The results supported the preliminary assumption of relative independence between convergent and divergent thinking. There is no evidence for a positive relationship between risk-taking and divergent thinking. However, a positive relationship between risk-taking and convergent thinking was observed, although it was evident only in two risk-taking measures. As previously found, the level of anxiety was related to lowering of test performance in any test situation where evaluation is being undertaken.

The present study investigates the relationship of risk-taking to both convergent thinking (as measured by traditional intelligence tests), and divergent thinking (as measured by creativity tests). Measures of anxiety have also been used since previous studies have shown that anxiety affects test performance.

The concept of convergent and divergent thinking was defined by Guilford (1967) following factor analyses of many intellectual abilities. Guilford has organized these abilities into a system composed of three dimensions known as *The Structure of the Intellect Model.* The three dimensions are: (a) *Content*, the medium of which thought occurs; (b) *Operation*, the mental operation formed on the medium; and (c) *Product*, the result of the action of the operation upon the medium. The four categories of the Content dimension are figural, symbolic, semantic and behavioral. Guilford had distinguished five categories of Operation: *evaluation, convergent thinking, divergent thinking, memory* and *cognition.* The product dimension consists of six categories: units, classes, relations, systems, transformation, and implications.

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Guilford and Hoepfner (1966) have defi convergent thinking as "the generation of formation from given information where emphasis is upon achieving unique or con tionally accepted best outcomes". It is lik that the given cue or information fully de mines the response. Convergent answers to q tions required that the examinee focus upon answer, where the answer must satisfy a uni specification or set of specifications. In present study, the Kuhlmann-Anderson T (Form D) was used to measure converg thinking.

Divergent thinking, in contrast to converg thinking, has been defined (Guilford Hoepfner, 1966) as the "generation of infor tion from given information where the empha is upon variety and quantity of output from same source and is likely to involve transfe Divergent thinking abilities are further ca gorized by their properties, which include flu cy, flexibility, originality and elaboration. T examinee may be asked how many words he c give which mean about the same as the wo "low". Non-specific answers are required a are evaluated in terms of their fluency, flexi lity, originality, and elaboration. Guilford a Hoepfner (1966) affirms that divergent thinki

operations are those most clearly involved in activities requiring creative behavior. Modified forms of the Torrance Tests of Creative Thinking, Figural and Verbal Forms (Torrance, 1966) were used in this study to assess divergent thinking abilities.

Although theorists have often referred to the risk-taking character of the creative person, the relationship between creativity and risk-taking remains primarily speculative.

McGuire (1964) stated that "unless the individual is willing to do so [take risks] he gives in to the pressure of conformity". Barron (1963) associates creativity with personal impulsivity and daring, and has referred to the risks involved in the desire to create. McClelland (1964) in his study of achievement, suggested that taking calculated risks is an aspect of scientific performance.

Guilford (1959), writing about the primary traits related to creativity, proposes that creative thinkers are flexible thinkers who really desert old ways of thinking and strike out in new directions, "getting away from the obvious, the ordinary, in order to make a good score". Guilford proceeded to describe the creative person as one who does well on tests of associational fluency because of a need for adventure, and an ability to tolerate ambiguity.

Guilford, Christensen, Frick and Merrifield (1964) found significant correlations between the tolerance for ambiguity and associational fluency in their study of relations between creative thinking aptitude and non-aptitude personality traits.

The first clear empirical test of the relationship between creativity and risk-taking was reported by Pankove and Kogan (1967). Their sample consisted of 162 fifth grade children (84 boys and 78 girls) drawn from elementary school classes. A significant relation between creativity and risk-taking, for a particular decision-making task was found among the boys, but not among the girls in their sample. Pankove and Kogan concluded that "implicit and explicit forms of risk-taking can be found at the level of childhood".

The research problem investigated here is the relationship of risk-taking, exhibited by grade six Filipino boys in three game-like activities, to convergent, and divergent thinking abilities, as measured by paper and pencil tests.

To ascertain the relationship of risk-taking to convergent and divergent thinking, the following hypotheses were tested: (1) Risk-taking is positively related to convergent thinking and (2) Risk-taking is positively related to divergent thinking.

In this study, risk-taking behavior is measured by responses on three game-like activities: Ring Toss, Fortune Wheel, and Clues. Motor skill, chance skill and decision-making of the information-seeking variety involving costs and prices are all introduced.

Three subscales of Sarason's (1960) Anxiety Scale are utilized in this study to assess the potential influence of anxiety on the relation between risk-taking behavior and convergent and divergent thinking abilities. They are test anxiety, general anxiety and a subscale to measure defensiveness.

METHOD

Subjects

The sample consisted of 200 sixth grade Filipino boys aged between 11 and 13 years. All were sixth grade pupils from a boy's private school in Quezon City. Of the original sample, only those 113 boys who completed all six instruments were included in the analysis.

Instruments

The two measures of divergent thinking utilized were the Verbal and Figural Forms of the Minnesota Tests of Creative Thinking developed by Paul Torrance and his associates at the University of Minnesota.

With variations in administration procedures, the instructions for all forms can be administered from kindergarten to graduate school.

In Manila, the Torrance Tests have previously been used with a kindergarten sample (Gustilo, 1968) and with a fifth grade sample (Gamboa, 1968).

Both of the divergent thinking measures represent a sharp departure from the single-factor tests developed by Guilford and his associates. Torrance's activities are designed as models of the creative process within the definitional framework of Guilford's divergent thinking operation. Each activity is hypothesized to involve an

interplay of the varied characteristics of divergent thinking, thus contributing something unique to the full battery of activities. Each activity is fairly complex reflecting the author's concern for the nature of creative thinking processes as well as for qualities of creative products and of creative personalities.

The specific figural and verbal activities administered in this study represented a combination of tasks selected from among Torrance's Form A and B activities. Tasks were selected following pretesting of the parallel forms on a group of 48 sixth grade children from a private school for girls in Quezon City. The choice of subtests combined for administration in the research proper was based upon the investigator's observations of the activities the children seemed to enjoy most, and on the apparent fluency and originality of the elicited responses in the pretests.

A simplified, informalized version of Torrance's original English instructions was adapted and the figural measure of divergent thinking included the following activities: Picture Construction, Incomplete Figures, and Parallel Lines. The Picture Construction activity was designed to stimulate originality and elaboration, while the Incomplete Figures activity and Parallel Lines activity were intended to elicit variation in the four major response characteristics: fluency, flexibility, originality, and elaboration. Each of the three activities was administered within a 10-minute time period.

The Torrance Verbal Test consisted of six tasks: Asking Questions, Guessing the Causes, Guessing the Results, Toy Improvement, Unusual uses for Cans, and Just Suppose. The specific sensory-motor behaviors, intellectual operations, and background knowledge assumed by Torrance (1966) to be involved in each of the Figural and Verbal activities are summarized in Table 1.

The Kuhlmann-Anderson Test (Form D) a standardized intelligence test for children, was used to measure convergent thinking. The entire test was designed to facilitate dealing with concepts, symbols, and relationships, rather than vocabulary knowledge, reading skills, and school training. Cronback (1960) characterized the Kuhlmann-Anderson Tests in general as being less of a direct reflection of achievement in school learning than other intelligence tests.

The Kuhlmann-Anderson Test, administered as a group test had the following verbal subtests: Anagram Elimination, Classification, Similarity Grouping, Antonyms, Dissected Words, Arithmetic Reasoning, Imbedded Figures, and Number Analogies.

TABLE 1

SUMMARY OF FACTORS INVOLVED IN THE TORRANCE TEST FIGURAL AND VERBAL ACTIVITIES

	1 Picture Construction	2 Picture Completion	3 Parallel Lines	1, 2, 3 Causes & Effects	4 Product Improvement	5 Unusual Uses	6 Just Suppose
Sensory Motor Behaviors							
Task engagement	*	*	*	*	*	*	*
Neck-hand eye coordination to record ideas	*	*	*				
Intellectual Operations							
Tension between "need for simple-easy completion and original production"		*					
Structuring and integrating		*	*				
Conflicts between four response tendencies (fluency, flexibility, originality and elaboration)			*				
Question asking				*		*	
Distinction of causes and consequences				*			*
Background Experience and Knowledge							
Familiarity with stimulus object					*	*	
Play experience with toys					*		
Familiarity with test conditions							*
Verbal fluency				*		*	*
Drawing experience	*	*	*				

Among the behaviors involved in performance of the Kuhlmann-Anderson Test are the sensory motor behaviors of speed and attention. The intellectual operations involved include selection and evaluation of alternate hypothesis, discrimination of similarities and differences, evaluation of degrees of similarity, reasoning, recognition of words, understanding the structure of the problem and following instructions. The background experience and knowledge required consist of a wide range of well-established concepts and generally high verbal facility.

The measure of anxiety in this study is referred to as the A-Scale, and its three subscales had been previously employed by Wallach and Kogan (1965) in their study of cognition, and was adapted from Sarason *et al.* (1960). The inventory has a total of 88 items – General Anxiety items (20), Test Anxiety items (19), Defensiveness items (33), Social Extroversion fillers (10 items), and general fillers (6 items).

The anxiety scale, including all subscales, was pretested on 40 fifth grade boys before its use with the research sample. Following pre-testing, to aid clarity, the test instructions were revised and several of the filler questions were modified to be more relevant to the local setting.

Lacking an instrument that has previously been shown to be an adequate measure of risk-taking, the present investigator designed several measures especially for use in this study.

Ring Toss. The ring toss measure used by Atkinson and Feather is a game involving tossing rings from a distance aimed at encircling a peg. In a study on achievement and motivation, Atkinson and Litwin (1966) used the ring toss to assess risk-taking. The task assumes a certain degree of motor ability involving body coordination. The ring toss was originally used in research with adult subjects without any reward. It was expected that children would perceive the task as a game-like activity and exert their best efforts, even in the absence of any reward beyond playing and achieving success in the game.

The Ring Toss measure was set up in specially constructed cubicles installed to prevent other children from observing and possibly influencing examinees' decisions as to the level of risk to be undertaken.

The test material consisted of a wooden peg two inches in diameter and twelve inches high, mounted on a round wooden base; steel rings ten inches in diameter; and ten lines marked on the floor at one foot intervals. The gymnasium floor tiles were used to measure intervals, two tiles representing a foot, or one interval. The closest line, one foot from the target, was numbered 1. The farthest line, ten feet from the target, was numbered 10. As proposed by Atkinson and Litwin (1966), the farthest distance from the peg was assumed to indicate the greatest risk, and the shortest distance from the peg was assumed to indicate the least risk.

Children were instructed to toss ten rings at the peg from a standing position anywhere between distances one to ten (1–10). They were told that the examiner would record the distance from which they tossed the ring for each of the ten trials.

This instrument was pretested on 20 boys from grades two and three at the same school as research sample. On the basis of the pretest, the distance from which the children were to toss the rings was formulated, and final instructions for the game were prepared.

It was observed that children who took part in the pretest were enthusiastic in shooting the rings at the goal despite their realization that there was no extrinsic reward involved.

Fortune Wheel. The Fortune Wheel measure, a form of gambling activity, was devised specially for the present study. The instrument was designed bearing in mind that gambling involves *loss* and *gain* inherent in taking risks. Wallach and Kogan (1967) have asserted that "highly important determinants of the riskiness of a decision are the magnitude of gain or reward attendant upon a successful decision and the magnitude of a loss or punishment consequent upon a faulty decision" (p. 133).

The risk-taking apparatus consisted of a wheel, 34 inches in circumference and 10 inches in diameter, divided into six colored wedge-shaped areas of varying magnitude. A six-inch long arrow rested on a block of wood fastened to the center of the wheel. The six colored areas were graduated according to area; the smallest area on the wheel received the greatest reward, the largest area, the smallest reward. While "betting" on the smallest areas was assumed to involve the greatest risk, betting on the largest areas was assumed to involve the least risk. A reward system utilizing plastic chips of equivalent states value was devised, for which the amount that could be won was proportional to the size of each area on the wheel. The areas of the wheel, its corresponding angles and its rewards are as follows:

Size of Area		Degrees of the Angles	Reward
1	smallest area	17.1°	60 centavos
2		34.2°	30 centavos
3		51.3°	20 centavos
4		68.4°	15 centavos
5		85.5°	12 centavos
6	largest area	102.6°	10 centavos

Each subject was instructed to put his finger on the area on which he wanted to bet. He was told that should the arrow stop there after it was spun by the examiner, he could win the amount equivalent to that indicated for the area. A reward of two pesos was promised, and later given to the subject earning the most points.

Clues. The third measure of risk-taking was called Clues. This test, adapted from Worley and Roberts, was used by Kogan and Wallach (1964) in their study of risk-taking. The present measure is a slight modification of the test used by those investigators. Instead of using words as clues, three pictures which consisted of a Face, A Chair, and A Dog, were used. Test three items were taken from Thurstone's Gestalt Completion Test.

For each of the three pictures, six overlays were made, each overlay representing one additional, incomplete portion of the Face, the Chair and the Dog. At the start of this activity, each child was given 75 centavos worth of chips. He was then instructed that the first clue would be provided free. If he decided to make a guess as to the identity of the completed object, with only the first clue provided, and was correct, he won the 75 centavos. If he guessed and failed, he forfeited all of his money. On the other hand, if the subject wanted to see more of the object, he asked for additional visual clues and paid an increasing amount in chips for each subsequent clue. The experimenter recorded the area chosen by the subject as a guess was made.

The following listing was placed before the child during the test period so that he could see how much each clue would cost, how much he would spend, and how much he could win.

Clue	Cost	Amount Spent	Amount of potential reward for a correct guess
1	Free	0	75 centavos
2	5 centavos	5 centavos	70 centavos
3	10 centavos	15 centavos	60 centavos
4	15 centavos	30 centavos	45 centavos
5	20 centavos	50 centavos	25 centavos
6	25 centavos	75 centavos	0 centavos

For each of the three objects, the Face, the Chair and the Dog, there were 270 ways of arranging the sequence of Clues. Three of the many ways of arranging the clues were tried on a group of 30 boys from grades three and four at the same school as the research sample. The boys were divided into three groups of ten, and for each group a different set of arrangement for the Clues was tried. The picture whose sequences of overlays did not easily give the objects away were used for gathering the data.

The investigator administered both the Torrance tests and the Kuhlmann-Anderson Test. Seven college graduates, six females and one male, assisted in the administration of the Anxiety Scale and the Risk-taking measures. All group tests were given in the children's regular classrooms, usually with the teachers absent.

Each instrument, in the order in which it was actually administered, is reviewed below.

The Torrance Test, Figural Form, was administered first. This instrument is not characteristic of the stereotyped psychological tests to which the children in the sample have become accustomed. It was administered first in order to capitalize upon the difference, and the possibility of establishing the relatively game-like atmosphere desired. Wallach and Kogan (1965) suggested that most observations of creative production seem to occur in the presence of what might be described as an "attitude of playfulness". They st the potential importance of promoting such an a phere in order to maximize the generation of as tive material.

The children were told that they were goi participate in a kind of game called "activit Throughout the administration, the word "test" avoided and was replaced by the word "activ

The following general directions were given:

Today, I would like you to participate in a game c activities. This game will give you a chance to use imagination in thinking of new ideas and expre them in pictures and words, and it will be fun for to do. There are no right or wrong answers in t activities and you may answer in any language dialect you like. Try to think of interesting, unus and clever ideas which you think no one else in group will think of. There will be three diffe things to do and you will be timed on each one, would like you to make good use of your time. Th of as many ideas as you can and work fast and w

Three minutes before time was called for each the three activities, the examiner reminded the ch ren to write the title of the drawing or drawings t they had made. Since some children found it diffic to stop when time was called for, they were asked hold their pencils up, and the examiner made sure t the children had turned to the next activity before s gave new test instructions. Some children who finish before time was up were told that usually, if they down quietly, new ideas would come to them and th could continue to add lines and shapes to their drawing

The Torrance verbal activities were all administere during class hours in the children's respective classroo within a two-week period. Before the test administr tion, the subjects were told that they were to continu with the activities which they had started earlier, b that this time, they were to use words.

For each of the first three activities, the childre were asked to refer to the stimulus picture of an e on page one of their booklets before instructions fo the next activity were given. After the third activity children were given a five-minute break period and wer told that they could stand and stretch. In some classes the children preferred to continue working so the break did not always last five minutes.

The Kuhlmann-Anderson Test was administered ir an hour in the children's respective classrooms. Sinc each of the seven activities involved had separate instructions, and time limits, the examiner made sure that the children who had finished before time was called did not proceed to the next activity. The specific instructions for the Kuhlmann-Anderson Test activities are found in the Kuhlmann-Anderson Technical Manual (Seventh Edition).

The Anxiety subtests were administered in the children's respective classrooms for approximately 45 minutes. The A-Scale was given as a group test. Each of the 88 was read and five-second interval was given before the next item was presented. All the children had copies of the instructions and statements read. The children were instructed to encircle the number preceding each statement that described them and were asked not to make any mark on the items that did not describe them. The directions were as follows:

This is a game called 'What I am like.' There are sentences below which I am going to read to you. You are to encircle the numbers of the statements that seem to describe what you are like. If the sentence does not describe what you are like, just leave it as it is. All right?

Each of the risk-taking measure was administered individually to each child.

Ring Toss. It took two minutes for the examiner to give the test instructions and for each boy to toss ten rings at the goal. Most of the children seemed very enthusiastic. After they were told by the examiner that they could toss the rings from any distance they wanted, some children asked, "Can I really stand anywhere?" Other children, and their teachers inquired whether this was a form of I.Q. test.

The following instructions were given:

Today, you are going to play a ring toss game. You will have ten shots at the target from any line you wish. You may move after each shot or you may shoot from any line you like. It is all up to you, and I will record your shots. All right? I will give you the rings one at a time.

Fortune Wheel. The Fortune Wheel measure was the second individual test administered. Testing was done in two rooms near the children's regular classrooms during the morning and afternoon class hours on two successive days. In a small room called the "playroom" each instrument was placed on top of a low table. Two chairs were placed around the table, one for the experimenter and one for the examinee. The correct amount of money chips were placed on top of each of the six segments of the Fortune Wheel. The following instructions were given:

This is a gambling game where you may choose any of these six parts. (The examiner pointed to each of the six different areas in the wheel). This smallest part is worth 60 centavos, the next 30, and then 20, 15, 12, and the largest part is worth 10 centavos. All right? Now I would like you to put your finger on the part you want to bet on and I will spin the arrow. (Examiner makes sure that subject has his finger on the area that he wants to bet on). You will win this amount if this arrow stops wherever your finger is pointing.

Clues. The Clues items were administered on two consecutive days. Each child was asked to sit down on a chair beside the examiner and given the following instructions for clues:

Today, we are going to play a game called Clues. In this game you must try to figure out the name of the object as soon as you can. There are six clues and I will show them to you one by one. You will start with 75 centavos' worth of chips (examiner hands the money chips to the child, making sure that the child is aware of the amount written on each chip). The first clue I will show you is free. If you decide to make a guess when you have been given the first clue and your guess is right, you win all the 75 centavos' worth of chips. If you are wrong, you lose all the money. The second clue costs 5 centavos. If you make a guess here and you are right, you can keep 70 centavos, and if you are wrong, you lose all the rest of the money.

The child was then instructed to look at the chart to see how much the clues cost, how much he would spend, and how much he would win if he made a right guess for each of the remaining four clues. Most of the children appeared very eager to take part in the game although some wondered why a gambling game should be allowed in the grade school. Some of the children's remarks concerned their school's Carnival Fair and Las Vegas. The time of test administration for each child varied from two to four minutes.

Scoring Procedures

Due to the rather complex scoring system of the Torrance Tests, both the Figural and Verbal Forms were scored by staff members of the Ateneo – Penn State Basic Research Program, Project Number 10. All four of the scorers had previous teaching experience and two were currently doing graduate studies. The Kuhlmann-Anderson, Form D, was scored by a fifth staff member of the same project.

The Anxiety Scale and risk-taking measures were scored by a graduate student and by the investigator.

A. *Torrance Figural Test*

Following the procedures established by the author, the first activity, Picture Construction, was scored for originality and elaboration. The second and third activities were scored for fluency, flexibility, and originality. Interscorer reliability coefficients computed for the work of the same scorers on 63 Torrance Figural Test papers were .99, .96, and .92, for fluency, flexibility, and elaboration, respectively (Bennett, 1969). Interscorer reliability coefficients for the originality score were not computed for the present data, however Torrance reported reliability coefficients of .91 and .86 for figural originality scored by twelfth grade teachers and seventh grade educational secretaries, respectively.

1. *Fluency.* This score was obtained by counting the total number of relevant responses for the entire activity. Following Torrance (1966), a "relevant response "which contains or makes use in some way of the stimulus element of the task."

2. *Flexibility.* This score is obtained by counting the total number of different categories into which a subject's response can be classified. The categories were determined by the test author, based on the responses of subjects from kindergarten through to high school. Prior to the utilization of the Torrance categories, careful checking was done to assure their relevance to the responses of Filipino children.

3. *Originality.* The originality score for each activity was based on an exhaustive tally of the responses of 300 sixth grade Filipino children from three schools in the greater Manila area. The tally included responses by boys from two sections of the present sample. Following procedures established by Torrance (1966) responses given by children from 4.00 to 4.99 per cent of the tally sample received one point, responses were given by 3.00 to 3.99 per cent and were awarded three points, and those given by 1.00 to 1.99 per cent received four credits. All other responses showing imagination and creative strength were credited with five points. The concept of "creative strength" has been applied by Torrance (1966) to responses requiring intellectual energy, those "characterized by being beyond what is learned, practiced, habitual, and away from the obvious and commonplace" in contrast with other "obvious, common, and learned responses" requiring little intellectual energy.

4. *Elaboration.* Two assumptions underlie the elaboration scoring of Activity 1, the Picture Construction Test, Activity 2, Picture Completion, and Activity 3, Parallel Lines.

The first is that the minimum or primary response to the stimulus figure is a single response. The second is that the imagination and exposition of detail is a function of creative ability appropriately labeled elaboration.

In scoring elaboration, credit was given for each pertinent (meaningful) detail or idea added to the original stimulus figure itself, to its boudaries and/or to the surrounding space. The basic response itself had to be meaningful, however, before elaboration was considered worthy of receiving a score.

5. *Figural score summation.* After scoring the activities five scores were derived for each test paper: (1) fluency, the sum of fluency scores for Activities 2 and 3; (2) flexibility, the sum of flexibility scores for Activities 2 and 3; (3) originality, the sum of originality scores for all three activities; (4) elaboration, the sum of elaboration scores for all three activities; and (5) Figural Test total score, the sum of fluency, originality and elaboration scores for all three activities.

B. *Torrance Verbal Test*

Each of the six Verbal activities were scored for three characteristics: fluency, flexibility, and originality. Interscorer reliability coefficients for the present scorers were not computed; Torrance, however, reported reliability coefficients for verbal fluency, flexibility and originality ranging from .80 to .99 among first to sixth grade teachers.

1. *Fluency.* Fluency for all six activities was defined as the total number of relevant responses, or responses that met the requirements of the tasks as set forth in the instructions. Thus, for example, the fluency score for the Ask and Guess Activity was the number of relevant questions the subject asked. Questions that could be answered merely by looking at the picture were not counted.

2. *Flexibility.* In all of the activities one point was given for each response which fell under each distinct response category.

The categories were developed by Torrance (1966) and were used for the present data only after careful consideration of their relevance to the responses of Filipino students.

3. *Originality.* Originality scores for the Verbal Activities were developed following an exhaustive tally of the responses of 300 Filipino children including boys from two sections within the present sample. The derivation of the percentage of responses associated with scores for all six verbal activities varied with the activity.

4. *Verbal score summation.* Overall scores for Verbal fluency, flexibility, and originality representing the sum of these respective scores for all six activities were derived. A total Verbal Test score was also computed by summing the fluency, flexibility, and originality scores for all six activities.

C. *Kuhlmann-Anderson Test*

Scoring was done utilizing the test keys accon nying the materials. Raw scores were employed ra than derived; intelligence quotients, as the norms deriving such indices were based on a sample from United States with questionable comparability to present sample.

D. *Anxiety Scales*

Scoring was done by a mathematics instructor by the present investigator. The scoring keys for G eral Anxiety, Test Anxiety, and Defensiveness of S son *et al.* as reported by Wallach and Kogan (19 were used.

Encircled items on each of the three subscales w counted, yielding one total score for General Anxie one for Test Anxiety and one for Defensiveness. assure scoring reliability the subscales were dou checked.

E. *Risk-taking measures*

The raw risk-taking data were recorded by the e perimenter during test administration, but for all thr instruments the scores were later tallied by a mathema ics instructor and the investigator. To ensure validi all scores were double-checked.

1. *Ring Toss.* Scores for this measure ranged fro one to ten, corresponding to the distance from the sp where the subject tossed the ring to the goal. Eac child had ten trials with a score for every trial. Scor for the following trials were derived: Trial 1, Trials 1–5 and Trials 6–10. The sum of all ten trials made up total score.

2. *Fortune Wheel.* Scores for the Fortune Whee ranged from 1–6. A score of one was designated a indicating the greatest risk and a score of six the leas risk. This test had ten trials and each student receive a score for each trial. Like the Ring Toss, scores for th trials were derived: Trial 1, Trials 1–5, Trials 6–10 and the sum of all 10 trials comprised the total score.

3. *Clues.* Clues scores ranged from 1–6, a score of one designating the greatest risk and a score of six the least risk. For each of the three stimuli there were six clues provided, but the number of clues actually utilized depended upon when each child was willing to hazard a guess. Each experimenter indicated on the record sheet of test administration whether the child made a guess when the first, the second, the third, fourth, fifth, or sixth clues were provided. There was a score for each of the three stimuli, and the summation of all these three scores made up a total score.

Statistical Analyses

The basic tool used in the statistical analyses of the data was the Pearson product-moment coefficient of correlation. The T-Test for independent groups was also used to assess the effect of the anxiety variable on convergent thinking, divergent thinking, and risk-taking.

A preliminary problem investigated was the relative independence of these two types of operation might

have been established prior to the administration of the anxiety and risk-taking measures. However, because of time pressure on both the subjects and the investigator this was not feasible.

Following the investigation of the intercorrelations the varied scores for measures of each separate characteristic, intercorrelations between the measures of risk-taking and convergent thinking and of risk-taking and divergent thinking were examined.

RESULTS

Convergent Thinking Measures

The significant positive correlation of .44 ($p < .001$) between the Verbal and Performance total scores of the Kuhlmann-Anderson Test indicates internal consistency in the two subscales.

Divergent Thinking Measures

As shown in Table 2, the intercorrelations among the four scoring methods for the Torrance Figural Test ranged from .28 to .94, and the intercorrelations among the three scoring methods for the Verbal Test ranged from .39 to .90. These correlations are all significant beyond the .01 level, indicating that the different Torrance scoring methods measure allied aspects of divergent thinking.

The correlations among the methods of scoring between the two separate subtests of the Torrance Test are also shown in Table 2. The correlations of Verbal Flexibility with Figural Originality (2.1), Figural Elaboration (.24), and Figural Total (.25) are all significant at the .05 level. The correlation between Verbal Originality and Figural Elaboration was .25 ($p < .01$), and between Verbal Originality and Total Figural Test was .23 ($p < .05$). The Total Verbal score correlated with Figural Elaboration, .20 and with Figural test, .21, both significant at the .05 level. Thus, it appears that not all subtests of both the Figural and Verbal Forms measured related aspects of divergent thinking, although total scores for both tests were significantly correlated.

Convergent and Divergent thinking

The coefficients of correlation between the Kuhlmann-Anderson and Torrance Tests were in general low, below the desired .05 significance level. Only two exceptions, Figural Originality, and Total Scores showed significant correlation with the Kuhlmann-Anderson Verbal subscale. This preponderance of low correlations between the two measures indicates their independence.

TABLE 2

INTERCORRELATIONS BETWEEN VERBAL AND FIGURAL FORMS OF THE DIVERGENT THINKING MEASURES

	Figural Form					Verbal Form			
	A	B	C	D	E	F	G	H	I
A. Figural Fluency									
B. Figural Flexibility	.94								
C. Figural Originality	.74	.69							
D. Figural Elaboration	.38	.28	.49						
E. Figural Total	.69	.60	.73	.93					
F. Verbal Fluency	.01	.01	.08	.08	.07				
G. Verbal Flexibility	.13	.10	.21	.24	.25	.45			
H. Verbal Originality	.07	.04	.17	.25	.23	.38	.71		
I. Verbal Total	.12	.08	.19	.20	.21	.54	.90	.87	

Pearson product-moment correlations of .32, .25, and .19 are significant at the .001, .01, and .05 levels, respectively, for the 100 degrees of freedom.

Risk-taking measures

The coefficients of correlation among the Ring Toss scores for Trial one and the mean scores for trials 1–5, trials 6–10, and total trials ranged from .52 to .93, all significant beyond .001 level.

The magnitude of correlations among the Fortune Wheel scores for trial one and mean scores for trials 1–5, trials 6–10, and total trials ranged between .28 and .86, all significant beyond the .01 level.

For the Clues stimuli, intercorrelations of scores among the Face, the Chair and the Dog ranged from .32 to .69, all significant beyond the .001 level. These high correlations, summarized in Table 3, point to the internal consistency of these measures.

The relationships among the three risk-taking measures (see Table 4) reflected a few scattered significant coefficients of correlation. However, no clear pattern appeared.

Risk-taking and convergent thinking

Contrary to expectation, scores on some of the risk-taking measures correlated significantly with the Kuhlmann-Anderson Test, the measure of convergent thinking. Correlations of all but one of the Ring Toss scores with the Kuhlmann-Anderson Verbal and Performance scores were significant at the .05 level (see Table 5).

None of the correlations among the Fortune Wheel trials and Kuhlmann-Anderson Test scores were significant.

Among the Clues stimuli, only the Dog correlated significantly ($p<.05$) with the Kuhlmann-Anderson Performance and Total test scores. This positive correlation indicates a negative relationship since low scores on the Clues stimuli represent the better performance.

These results do not support the hypothesis of the independence of risk-taking as measured here, and convergent thinking.

Risk-taking and divergent thinking

As indicated in Table 6, the magnitude of all correlations among the risk-taking and divergent variables was negligible. This result supports the interpretation that there is no relationship between risk-taking and divergent thinking as measured here.

Anxiety and other variables

The Kuhlmann-Anderson Verbal Test correlated significantly and negatively with Test Anxiety ($r = -.26$), Defensiveness ($r = -.20$), and Total Anxiety ($r = -.25$), all beyond the .05 level.

Except for the relationship between Verbal Originality and Test Anxiety ($r = -.20$, $p < .05$), correlations between Anxiety and both measures of divergent thinking were not significant.

Of the risk-taking measures, only the Clues stimuli were significantly correlated with the three Anxiety scores. In this case, the increased total anxiety was associated with improved performance on the Dog stimuli ($r = -.22$, $p < .05$) and increased Test Anxiety, with improved performance on both the Face ($r = -.20$, $p < .05$). When all three Clues items were combined a significant positive correlation with Total Anxiety indicated that decreased levels of Total Anxiety are associated with better performance on the Clues stimuli.

The subjects were divided into two groups based on total anxiety score. One group re-

TABLE 3

INTERCORRELATIONS BETWEEN THE DIVERGENT THINKING MEASURES AND THE CONVERGENT THINKING MEASURES

Torrance Tests of Creative Thinking	Kuhlmann-Anderson Test		
	Verbal	Performance	Total
Figural Fluency	.14	−.13	.02
Figural Flexibility	.15	−.13	.02
Figural Originality	.26	.03	.18
Figural Elaboration	.19	.00	.12
Figural Total	.23	−.03	.13
Verbal Fluency	−.18	−.04	−.14
Verbal Flexibility	.04	.05	.05
Verbal Originality	.17	.00	.11
Verbal Total	.04	.00	.03

Pearson product-moment correlations of .25 and .19 are significant at the .01 and .05 levels, respectively, for 100 degrees of freedom.

TABLE 4

INTERCORRELATIONS AMONG THE THREE-RISK-TAKING MEASURES

	Ring Toss				Fortune Wheel				Clues			
	A	B	C	D	E	F	G	H	I	J	K	L
A. Ring Toss (trial 1)												
B. Ring Toss (trial 1–5)	.91											
C. Ring Toss (trial 6–10)	.52	.69										
D. Ring Toss (total trials)	.79	.93	.91									
E. Fortune Wheel (trial 1)	−.09	−.16	−.25	−.22								
F. Fortune Wheel (trial 1–5)	−.15	−.22	−.22	−.25	.57							
G. Fortune Wheel (trial 6–10)	−.05	−.07	−.06	−.07	.28	.44						
H. Fortune Wheel (total trials)	−.11	−.17	−.17	−.18	.51	.86	.83					
I. Clues Face	−.08	.13	.15	.16	−.01	−.15	−.22	−.21				
J. Clues Chair	−.07	.01	.11	.05	.10	−.05	−.29	−.04	.64			
K. Clues Dog	.03	.05	.10	.08	.00	−.11	−.14	−.16	.69	.64		
L. Clues Total	−.02	.02	.10	.07	.13	.02	.09	−.01	.59	.62	.32	

Pearson product-moment correlations of .32, .25, and .19 are significant at the .001, .01, and .05 levels, respectively, for 100 degrees of freedom.

presented the 25 percent of the subjects with the highest anxiety scores. The other group was the 25 percent with the lowest anxiety scores. Independent sample t-tests were done on the mean scores obtained by these two groups of the various other measures.

The low anxiety group scored significantly higher on the Kuhlmann-Anderson Verbal subtest ($t = 3.22$, $p < .01$) and the Kuhlmann-Anderson Total ($t = 2.87$, $p < .01$). The low anxiety group also obtained significantly higher scores on Ring Toss trials 1–5 ($t = 2.22$, $p < .05$) and on the Ring Toss trials 1–10 ($t = 2.31$, $p < .05$).

These results, shown in Table 7, indicate that low levels of anxiety are associated with better performance on the Kuhlmann-Anderson Verbal Test and trials 1–5 on the Ring Toss.

DISCUSSION

The significant correlations found between the Kuhlmann-Anderson Verbal and Performance subtests and between the subtests and the Total Score reflect the internal consistency of the instrument. This is in consonance with Ben-

TABLE 5

INTERCORRELATIONS BETWEEN THE RISK-TAKING MEASURES AND THE CONVERGENT THINKING MEASURE

Risk-taking Measures	Kuhlmann-Anderson Test		
	Verbal	Performance	Total
Ring Toss (trial 1)	.20	.26	.27
Ring Toss (trials 1–5)	.26	.28	.31
Ring Toss (trials 6–10)	.22	.17	.23
Ring Toss (trials 1–10)	.26	.24	.29
Fortune Wheel (trial 1)	.14	.09	.13
Fortune Wheel (trials 1–5)	−.09	−.05	−.09
Fortune Wheel (trials 6–10)	−.06	−.04	−.06
Fortune Wheel (trials 1–10)	−.08	−.05	−.08
Clues Face	.18	.11	.18
Clues Chair	.17	.06	.14
Clues Dog	.16	.20	.21
Clues Total	.17	.08	.15

Pearson product-moment correlations of .25 and .19 are significant at the .01 and .05 levels, respectively, for 100 degrees of freedom.

TABLE 6

INTERCORRELATIONS BETWEEN THE RISK-TAKING MEASURES AND THE DIVERGENT THINKING MEASURES

Torrance Tests of Creative Thinking	Ring Toss				Fortune Wheel				Clues			
	trial 1	trial 1–5	trial 6–10	Total	trial 1	trial 1–5	trial 6–10	Total	Face	Chair	Dog	Total
Figural Fluency	−.06	−.08	−.04	.07	.04	−.03	.05	.01	−.09	.02	.13	.11
Figural Flexibility	−.04	−.06	.00	−.03	.07	−.03	.01	−.02	−.05	−.02	−.07	−.12
Figural Originality	.02	.04	.06	.06	.09	−.08	.09	.00	−.07	−.01	−.03	.09
Figural Elaboration	.06	.09	.11	.11	−.07	−.11	−.02	−.07	−.01	.05	−.07	.06
Figural Total	.04	.05	.08	.07	−.02	−.10	.01	−.06	−.04	.03	−.08	.00
Verbal Fluency	.01	.03	.06	.05	.04	.02	−.05	−.01	−.04	.00	−.11	.00
Verbal Flexibility	.09	.04	.04	.04	.04	−.02	−.10	−.06	.05	.05	−.02	.15
Verbal Originality	.05	.05	.06	.06	.11	.07	.03	.07	.07	.17	−.08	.17
Verbal Total	.03	.03	.04	.03	.05	.01	−.05	−.02	.09	.16	−.01	.16

Pearson product-moment coefficient of correlation of .19 is significant at the .05 level, for 100 degrees of freedom.

TABLE 7

INTERCORRELATIONS BETWEEN THE ANXIETY VARIABLES AND THE CONVERGENT THINKING, DIVERGENT THINKING AND RISK-TAKING VARIABLES

	Anxiety Scales			
	Gen. Anxiety	Test Anxiety	Defensiveness	Total
Convergent Thinking				
Verbal	−.11	−.26	−.20	−.25
Performance	.02	−.14	−.10	−.06
Total	−.06	−.24	−.18	−.19
Divergent Thinking				
Figural Fluency	−.06	−.12	−.08	−.11
Flexibility	−.08	−.17	−.12	−.16
Originality	−.02	−.14	−.03	−.08
Elaboration	−.01	−.07	.00	−.04
Total	−.03	−.12	−.03	−.08
Verbal Fluency	.09	.13	.15	.16
Flexibility	.09	−.08	.16	.03
Originality	.01	−.20	.18	−.03
Total	.04	−.10	.08	.04
Risk-Taking Variables				
Ring Toss (trial 1)	.01	.04	.10	.04
Ring Toss (trials 1–5)	−.05	−.07	−.13	−.10
Ring Toss (trials 6–10)	.04	−.08	−.16	−.05
Ring Toss (trials 1–10)	.00	−.08	−.15	−.08
Fortune Wheel (trial 1)	.12	−.05	.00	.05
Fortune Wheel (trials 1–5)	.12	−.03	.07	.09
Fortune Wheel (trials 6–10)	.04	.09	.15	.12
Fortune Wheel (trials 1–10)	.14	.03	.15	−.14
Clues Face	−.05	−.26	−.01	−.14
Clues Chair	.07	−.20	.12	.00
Clues Dog	−.17	−.19	−.19	−.22
Clues Total	.39	−.22	.30	.24

Pearson product-moment correlations of .32, .25, and .19 are significant at the .001, .01, and .05 levels, respectively, for 100 degrees of freedom.

nett's (1969) findings based on separate groups of sixth grade boys and girls at private schools in the Greater Manila area.

Correlations among the various scoring methods for each of the Torrance measures were highly significant, indicating internal consistency of the two tests. The generally non-significant correlations between scores on the figural and verbal measures support Torrance's findings.

The generally low and negative correlations between the Kuhlmann-Anderson Test and the Torrance Tests of Creative Thinking as shown in Table 3, indicate that convergent and divergent thinking as measured here are independent. Similar results were reported by Wallach and Kogan (1967) and by Pankove and Kogan (1967) using Guilford-like tests to measure creativity.

The evidence extends the often-confirmed finding of statistical independence between convergent and divergent thinking to a sample differing in genetic and cultural background from those previously studied. Identification of the intelligent Filipino child using traditional measures of intelligence such as the Kuhlmann-Anderson Test clearly will not assure determination of the most divergently creative within his group.

The implication for educators of this important discovery may serve as a guideline in identifying two different, but parallel, modes of thinking. The distinction between convergent and divergent thinking would seem to need more attention by grade-school educators and curriculum planners. It is likely that convergent thinking (i.e., learning facts, answering questions which require one unique answer, etc.) has been valued and reinforced by both teachers and parents, while divergent thinking (i.e., thinking of novel ideas, giving diverse answers to questions, etc.) has not received sufficient encouragement in the classrooms. The relatively successful differentiation of convergent and divergent thinking abilities indicates that it would be desirable to plan a curriculum that will prompt teacher reinforcement of divergent thinking and provide opportunities for the development of divergent thinking abilities.

Risk-taking and Other Variables

Among the risk-taking measures, scores for trials 1–5 on the Fortune Wheel correlated significantly with the Ring Toss scores for all ten trials. It is possible that after the 5th trial on the Fortune Wheel, the novelty of the activity wore off, and the children ceased to take risks. Continual involvement and risk-taking were apparent throughout all 10 trials on the Ring Toss activity.

The lack of significant correlation between the Clues and both the Ring Toss and Fortune Wheel activities indicates that these instruments may not be measuring the same attribute. It is possible that Clues measures visual perception and intelligence rather than risk, as the items utilized for the clues activity were taken from the Gestalt Completion Test.

Unexpectedly, the Ring Toss correlated highly with the Kuhlmann-Anderson, the measure of convergent thinking. It is possible that Ring Toss as a risk-taking activity calls upon intelligence factors such as judgment of space and distance. It also seems possible that the more intelligent children, having often been rewarded for their abilities in the past, are more self-confident and show a greater tendency to take risks.

The correlation of Ring Toss trials 6–10 and the Kuhlmann-Anderson Performance score fell short of statistical significance. The lowered correlation may be attributable to the weakening of risk-taking response tendency akin to the experimental extinction described by Dollard and Miller (1965). When shooting the rings over the goal, the tendency to increase the shooting distance from the goal may have decreased. It is possible that standing close to the goal may have been positively reinforced by success, despite the low score attained; that is, a score of one may have been more reinforcing than a score of zero.

Among the three Clues stimuli, only the Dog stimulus correlated significantly with the Kuhlmann-Anderson. This positive correlation should be interpreted as a negative relationship, as a low score on the Clues indicates a better performance. Thus, asking for a greater number

of Clues is associated with lower intelligence. This may possibly be another example of lack of "self-confident" behavior, based on a history of self-perceived lack of ability.

It is interesting to note that when the Ring Toss and Clues were administered, the children participating were heard to ask each other whether the games were a form of intelligence test. Some of the children even approached an examiner and said, "Is this an IQ test ma'am?" From this type of comment, it would seem possible that if a child treated the tasks as intelligence measures, the child's not taking a risk might represent self-perceived inability on such measures, based on his past negative experience.

The lack of a significant relationship between risk-taking and divergent thinking in the sample is shown by the very low and sometimes negative coefficients of correlation between test scores on the two types of measures. This finding is consistent with findings of previous studies. Pankove and Kogan (1967) in their study of creativity and risk-taking among 84 male and female 78 fifth grade students found that their risk-taking measures, Draw a Circle, Clues and Shuffleboard, did not correlate significantly with Guilford-like tests of creativity. Pankove and Kogan found that only the Shuffleboard activity correlated significantly with creativity and only among the boys in their sample.

The present study does not reverse the direction of previous findings, thus the hypothesized positive relationship between risk-taking and divergent thinking still remains speculative.

Anxiety and Other Variables

The significant negative correlations found between the anxiety scales and the Kuhlmann Anderson Test indicated that the less anxious and less defensive children did better on the Kuhlmann-Anderson Verbal Test.

Although the divergent thinking measures employed in this study were the game-like than test-like, test anxiety could have affected the performance on the Verbal originality subtest. Children who scored high on the Verbal originality subtest were low in test anxiety. One possible explanation is that children with bett facility in English were less anxious, could thin of more original ideas, and thus scored bett in Verbal originality.

The t-test showed that the low anxiety grou scored significantly higher on the Kuhlmann Anderson Verbal Test and the Kuhlmann Anderson Total Score. This result confirme the correlation obtained between Total Anxiet and the Kuhlmann-Anderson Verbal subtest although Total Anxiety did not correlate signif icantly with the Kuhlmann-Anderson Test scores Verbal originality, and some items on the Clues activity, correlated positively, and significantly, with total anxiety.

The low anxiety group obtained significantly higher scores on the Ring Toss trials 1–5, and Ring Toss trials 1–10, but not on any other risk-taking or divergent thinking measure. The slightly varying results of the t-test from the Pearson r may have resulted from a selection of two extremes groups (high and low) for the t-test analysis. Nevertheless, they give further evidence that lower levels of anxiety are associated with better performance on certain kinds of tests.

In the present study, the indication that low levels of anxiety are related to better performance on the Kuhlmann-Anderson Verbal Test and the Clues measures, support the concept of an interfering effect of anxiety under certain testing conditions described as "test-like" in quality. Sarason *et al.* (1960) demonstrated this effect when they found that anxious children had more difficulty than their non-anxious peers with tests like the Figure Drawing, Rorschach, Color-naming tasks, and the Porteus Mazes.

Sarason suggested two situation precipitants for anxiety arousal – perceived evaluation, and possible rejection. In regard to the first factor, no matter how the test is administered, the child perceives himself as being evaluated. The children in this sample were accustomed to intelligence tests from their local guidance office and thus may have regarded any outside testing as a form of intelligence test. It is this evaluation factor that may arouse anxiety.

The second factor, rejection, may also function in the present study. In the test situation, where the child is encouraged to do what he likes, to answer the test questions as he understands them, or to draw as he pleases, any subtle perceived rejection by the examiner may heavily influence the especially insecure and dependent child who is uncomfortable in an unstructured situation. The knowledge that the child cannot depend on the evaluator for gratification of his needs, increases the strength of anxiety. Rejection may have been a stronger reason for the arousal of anxiety in the present sample, since for the Filipino, "there appears to be little value attached to early development of independence" (Guthrie and Jacobs, 1966).

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