

COMPARISON OF STUDENTS' AND COMPETENT
GYMNASTIC JUDGES' EVALUATIONS
OF SIDE HORSE VAULTING

By

LA RUE H. HEATH

Bachelor of Science

University of Oklahoma

Norman, Oklahoma

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Thesis Approved:

A. B. Harrison

Thesis Adviser

Albin P. Warner

D. D. Durham

Dean of the Graduate College

696153

PREFACE

This research was concerned with determining if seventh, eighth, and ninth grade students in gymnastic classes, who had received some instruction in judging, were capable of making valid judgements of fellow class members in side horse vaulting. Means, standard deviations, correlations, and t-ratios were computed between the ratings of five competent adult gymnastic judges and the ratings of special combinations of junior high school girls to solve the problem.

I would like to take this opportunity to express my appreciation for the assistance and guidance of my adviser, Dr. Aix B. Harrison, who was always available for counsel and direction. Special thanks also go to Dr. Homer Coker, because without his encouragement and interest this thesis would never have been attempted.

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CHAPTER I

INTRODUCTION

The gymnastic program for girls at Wilson Junior High School in Tulsa, Oklahoma, during the school year, 1966-67, included the balance beam, side horse vaulting, and free exercise. It was necessary for this program to be conducted in two teaching stations: free exercise in the large gym which was eighty-four feet by fifty feet, and performance on the two balance beams and one horse in the small gym which was forty-nine feet by twenty-five feet. The testing at the end of the unit was limited to students performing on only one apparatus. There were several reasons for this. Two women physical education teachers used these facilities, so that the program planned and the time allotted for it had to accommodate both. Students had limited amounts of equipment on which to practice; and one teacher had to evaluate the routine or vaults of each student. Six days were required for individual testing by teacher evaluation in classes that ranged from forty to seventy students. This type of evaluating soon left a large number of students with nothing to do. It was fortunate that the weather at this particular time of the year, February, was good. After twelve students were tested, they were allowed to go outside to play basketball. They were not under direct supervision and although no problem arose, this was not a desirable situation.

Considering the class size, space, facilities, and equipment, the

program was satisfactory in all phases except grading. It was felt that the length of time required for testing by teacher evaluation of each student was too long, that the students should have been tested on more than one apparatus, and that the students should have had the opportunity to experience judging in gymnastic activities.

The most logical solution to alleviate these three shortcomings of the gymnastic program would be to include instruction for the students in judging gymnastics. At the end of the unit, students could be used to assist the teacher in evaluating or judging fellow students in several gymnastic activities and the time necessary for testing would be shortened with the additional help. With this in mind, the investigator decided to determine if this were feasible and practical, and if a particular group would prove superior over another in judging gymnastics.

Statement of the Problem

The purpose of this study was to determine if junior high school girls were capable of making valid judgements of fellow class members in side horse vaulting. The sub-problems were to determine if any of the following seven classifications were superior to the others in their judgement. The classifications were as follows: seventh grade students, eighth grade students, ninth grade students, student physical education leaders, students demonstrating high gymnastic ability, and students with an I.Q. of 110 or higher.

Hypotheses of the Study

This study was designed on the basis of four hypotheses:

1. Students in the seventh, eighth, and ninth grade

gymnastic classes, who had previously received some instruction in judging, are capable of making valid judgements in side horse vaulting of fellow students.

2. Student leaders in the eighth and ninth grade gymnastics classes, who had previously received some instruction in judging, are capable of making valid judgements in side horse vaulting of fellow students.
3. Students in the seventh, eighth, and ninth grade gymnastic classes demonstrating high gymnastic ability, who had previously received some instruction in judging, are capable of making valid judgements in side horse vaulting of fellow students.
4. Students in the seventh, eighth, and ninth grade gymnastic classes with an I.Q. of 110 or higher, who had previously received some instructions in judging, are capable of making valid judgements in side horse vaulting of fellow students.

Importance of the Study

In 1963, gymnastics was included in the physical education curriculum of the Tulsa Public Schools upon the recommendation of Mrs. Beatrice Lowe, Supervisor of Secondary Girls' and Elementary Physical Education. Several in-service courses and clinics were held to give training to the teachers on methods and techniques of teaching gymnastics. Also a "Teacher's Guide for Gymnastics and Posture" was developed through the cooperative efforts of the girls' physical education teachers in the junior and senior high schools and men and women physical education

teachers in the elementary schools. None of these resources suggested a workable method of classroom grading as they only presented teaching procedures and not evaluating techniques. This research will be important to the gymnastic program of Tulsa, as well as that of other cities with similar programs, if it can show that it is feasible for students to evaluate fellow students with teacher supervision.

Limitations of the Study

There are several evident limitations in this study. Teacher judgement was used in selecting student physical education leaders at the beginning of the school year. Their selection was not always based on their athletic ability as other factors had to be taken into consideration. A few of these were the composition of the class due to scheduling, the desires of the students, the needs of the students, and the needs of the teacher. Also, teacher judgement was used in selecting the high gymnastic ability group after observing the girls practice eight class periods on one apparatus of their choice. This selection was made one week before the unit was completed and the testing was started.

The space in which the program was conducted was limited, as only a small gym, forty-nine feet by twenty-five feet, was available. The equipment in this room was limited as only one vaulting horse, one high and one low balance beam, and one set of uneven bars were available. The number of mats was sufficient. The arrangement of the apparatus allowed a distance of twenty-six feet for the run prior to the hurdle and take-off. A distance of twenty-five to fifty feet for the run is recommended by most coaches. A Reuther board was not available so an inclined board of thirty-six by twenty-two inches, and rising from a

height of three-fourths of an inch to four and one-half inches with no spring mechanism, was used as the take-off board.

The daily physical education program for this nine week block included the volleyball classes, the volleyball round robin intramural tournament, the volleyball class round robin tournament, the dance class, and the gymnastic program. This presented organizational problems and prevented a concentrated gymnastic unit from being offered. Instead, the students participated two days a week for nine weeks in the gymnastic program, spending approximately thirty to thirty-five minutes of each fifty-five minute class period in activity. Dressing and showering accounted for the remaining class time.

This research was designed for a specific situation rather than a general situation; however, with minor adjustments, this study could be conducted in other schools. Only one gymnastic activity was included in this research due to the lack of time and the availability of competent judges.

Assumptions of the Study

Four assumptions were made in this study. First, that the judges selected would validly evaluate the side horse vaulting of the students by basing their judgement on knowledge of proper vaulting form. Second, that the students would evaluate, to the best of their abilities, the side horse vaulting of fellow students. Third, that all phases of the operational procedures and the test would be comprehensive and easily understood. Fourth, that if the students are capable of making valid judgements in side horse vaulting, then it can be concluded that they are capable of making valid judgements in other gymnastic events.

CHAPTER II

REVIEW OF RELATED LITERATURE

No information was found concerning the evaluation of performers in gymnastics, other than technical judging of the performances or teacher evaluation. Numerous books and articles were valuable, however, in determining skills to be taught, progression in teaching the skills, testing requirements, judging requirements, and the necessity for developing interested and accomplished performers as future judges.

An article by Orwyn Sampson, "Grading Gymnastics at the United States Air Force Academy," explained a simple method which he used to evaluate fourteen to sixteen students who received ten hours of instruction in gymnastics. Twenty-eight skills and stunts on four different pieces of apparatus were presented in class instruction. Students were required to pass a minimum of eight of these exercises, two on each apparatus, before completing the course. The instructor kept a chart posted on the bulletin board so progress could be noted day by day by both the students and the instructor.

The instructor's evaluation of the students was based on a simple point system: one point for satisfactory execution which showed deficiency in form, strength, continuity and poise; two points for average form, strength, continuity and poise; and three points for above average form, strength, continuity and poise. Scores could be upgraded at any time. The instructor determined the student's grade at

the end of the course by combining the quantity score, which was the total number of exercises accomplished, and the quality score, which was the total point value of each exercise accomplished.

Mr. Sampson stated that this was an effective grading system because it was simple, it freed the instructor and allowed him more time to teach, and it was popular with the students. It provided a visual incentive and let the students know where they stood at all times, it could be used for large or small classes, and it took into account both quantity and quality of performance.¹

Robert W. Freeman of Morristown, New Jersey Y.M.C.A., pointed out the necessity of training competent judges and suggested a lesson be taken from the swimming program conducted in the United States. There are two ingredients in one phase of the sport of swimming to which beginning judges are introduced. Ingredient number one is the large number of people who have knowledge of the sport. The second ingredient is the tremendous growth of the age-group swimming program. It has been estimated that there are 300,000 age-group swimmers in this country today.

In gymnastics the knowledge is only at the top level and there is not a large age-group program. Mr. Freeman believes that the reason for this situation is the lack of leadership on the lower level. People are needed who have a knowledge of gymnastics similar to the thousands of volunteer swimming instructors. Also, there is a lack of judges, people who have a knowledge of evaluating a gymnastic performance, and a lack of adequate facilities with the necessary gymnastic apparatus.

¹Orwyn Sampson, "Grading Gymnastics at the United States Air Force Academy," Physical Educator, 22:4, December 1965, pp. 163-164.

Beginning judges can best be introduced to gymnastics through compulsory exercise. This can also provide an established set of routines for coaches and teachers. It furnishes the setting for children to gain an early appreciation and education of the sport. When children perform the same compulsory exercise or routine, the winner is that child who executes it with the best form. As skill increases, children will demand more advanced competition which will require more knowledge and training. Japan uses both compulsory and optional routines in its age-group competition.

In this type of program, the beginning judge of compulsory routines learns "the relatively simple rules of judging the EXECUTION of a routine. He is not immediately overwhelmed by the other two phases of judging, DIFFICULTY and COMBINATION." He can advance to these later in the same manner the student advances with experience and additional training.²

Sam Bailie, the gymnastic coach of the University of Arizona, discussed scoring in gymnastic meets in his article, "We Must Have a New Scoring System." Mr. Bailie, as well as many others in the gymnastic field, feels that our present scoring system of ten maximum points is outdated with the advancements that have been made in gymnastics during the last eight years. In some areas of the United States a new system is now being tried in an attempt to remedy some of the problems. Judging responsibilities are divided among several judges with each judge responsible for one part or aspect of the routine. These parts are style, execution, continuity and form.

²Robert W. Freeman, "Is It Possible..For the U. S. Gymnastic Program to Take a Lesson from the U. S. Swimming Programs," Modern Gymnasts, VII:3, March 1965, pp. 7-8.

Several changes have been recommended by Mr. Bailie in the scoring of competitive gymnastic meets. The "Judge of Difficulty" should record the number of C (combination) and D (difficulty) moves and give the exact rating of the difficulty of the routine. The percentage allowed for difficulty should be raised from the present amount of 3.4 of the total 10.0 points. The remainder of the score should be divided among the four judges who are responsible for style, execution, continuity and form. Points for any flaw should be deducted from the total 10.0 points.³

M. D. Adolph briefly discussed the present system of judging and rules of the F.I.G. (Federation of International Gymnastics) Code of Points. An exercise must have the following qualifications to obtain a maximum score of 10.0 points: eleven skills, six of which are "A" moves or skills of simplest difficulty, four of which are "B" moves or skills of average difficulty, and one of which is a "C" move or skill of highest form of difficulty. A penalty of tenths of a point or a whole point for each fault should be subtracted from the total score. Three major considerations of a routine and the point value of each are execution, 5.00; difficulty, 3.40; and combination, 1.60.

There are five judges, one of whom is a referee judge. The scoring of each judge is based on 10.0 points, and the highest and lowest of the four scores are eliminated and the two middle scores are then added and divided by two for the final score.

The judges should base their score of these requirements for a perfect score of 10.0 points: "execution of each individual skill to its

³Sam Bailie, "We Must Have a New Scoring System," Modern Gymnasts, VII:3, March 1965, pp. 12-13.

highest potential; proper timing, rhythm, and continuity; perfect form; exercise mechanically correct; confidence with impressiveness; and lastly, neat and well-groomed appearance with a readiness for an elegant performance."⁴

The specific requirements for side horse vaulting that are listed under 'Judging and Marking--Individual Events' in the "U.S.G.F. Rules and Policies Governing Girl's and Women's Competition" are as follows:

1. The run should be rapid, smooth and controlled, rhythmical and light. .25 points
2. The hurdle and take-off must be quick and without loss of speed, light, and relatively noiseless. .25 points
3. The pre-flight to the horse must have distance and be executed with a straight body. 2.0 points
4. The vault over the horse must be executed with the body passing over the horse in the proper position. 2.5 points
5. The hand-touch and push-off must be quick and powerful, and cause the body to move in an upward-forward direction. 1.0 points
6. The after-flight off the horse must have distance and height. The body should straighten upward before arriving on the floor. 2.0 points
7. The landing must be secure, light and controlled, and without excessive forward lean or bending at the knees and hips. 2.0 points"⁵

A section, relating to judging and grading, of the book by Eric Hughes, Gymnastics for Girls, discussed the A.A.U. rules for competition and judges. Two methods of judging were presented: method I, the judge keeps a check list as the routine progresses without taking his eye off the performer; method II, the judge keeps the record by memory and records the score after the routine is over.

⁴M. D. Adolph, "Judging Artistic Gymnastics," Modern Gymnasts, VII:3, March 1965, p. 13.

⁵"U.S.G.F. Rules and Policies Governing Girl's and Women's Competition," Modern Gymnasts, VII:6, July and August 1965, pp. 10-11.

Mr. Hughes suggested that there are many methods of organization possible for competition and grading in the classroom. The best performer may be placed at the head of the squad. Later these squad leaders can compete in a class situation. A check list of stunts for each student to perform may be posted on the bulletin board. A record board may be posted giving the name of the student who can do the greatest number of pull-ups, the farthest handwalking distance or similar skills. An individual achievement board might appeal to some students. Also, one might conduct a ladder tournament, or play follow the leader or "add on."

Mr. Hughes feels it is possible to conduct competition between squads of equal ability and use students, the squad leaders, or the better performers in the class as judges. In this type of meet, short routines or a compulsory stunt in which one simply tries to beat his opponent, prove most satisfactory. The final team score determines the winner. This same method can be used in Intramurals.⁶

Eric Hughes, in his book Gymnastics for Men, indicated that the gymnastics grade in physical education should be based on a performance of a compulsory routine and a knowledge test. Also, extra credit could be given for an optional routine composed by the student. He included in his book two compulsory routines in all gymnastic activities that could be used in this grading situation. A knowledge test could include questions concerning performance of stunts, spotting techniques, safety precautions, rules of the event, and care of the equipment.

⁶Eric Hughes, Gymnastics for Girls (New York, 1963), pp. 227-248.

⁷Eric Hughes, Gymnastics for Men (New York, 1966), pp. 20-21, pp. 108-149.

CHAPTER III

RESEARCH PROCEDURES

The purpose of this study was to determine if junior high school girls were capable of making valid judgements of fellow class members in side horse vaulting. The statistical method selected to solve this problem was to determine the product-moment correlations between the scores awarded by the five competent, adult, gymnastic judges and the scores awarded by the junior high school girls. Formulas used in the computations are listed in Appendix E. Specific groupings of students were used to determine if one group was superior to another. They were as follows: seventh grade students, eighth grade students, ninth grade students, total seventh, eighth, and ninth grade students, eighth and ninth grade student physical education leaders, seventh, eighth, and ninth grade students demonstrating high gymnastic ability, and seventh, eighth, and ninth grade students with an I.Q. of 110 or higher.

The sixth hour physical education class of forty-nine students was selected to participate in this study for several reasons. First, the students represented a typical cross-section of junior high school girls because the seventh, eighth, and ninth grade class members possessed a wide range of socio-economic levels, physical abilities, and I.Q.'s. Secondly, the investigator was the teacher for all three grade levels since sixth hour was the planning period for the other physical education teacher. The composition of the class is identified in Table I.

TABLE I
CLASSIFICATION AND NUMBER OF STUDENTS

Hour	Class Members			Leaders		Total
	Seventh	Eighth	Ninth	Eighth	Ninth	
6th	22	9	11	3	4	49

An I.Q. of 110 or higher was selected as the basis for the high I.Q. group in comparing its scores with the judges' scores. The most recent I.Q. scores for members of the class were from the "Otis Beta Mental Ability Test" which was administered to the seventh grade students in September, 1967, the eighth grade students in September, 1966, and the ninth grade students in September, 1965. These individual scores are recorded in Appendix A. I.Q. scores were not available for two ninth grade girls and two seventh grade girls so they were not included in computing the range and mean. It was assumed, however, that their scores would fall within the range indicated because of their performance in school. Also, a special education student in the seventh grade whose I.Q. was 64 was not included because it was felt that her extreme score would affect the mean. With the preceding limitations, the range and mean of the I.Q. scores for the different groupings are found in Table II.

The gymnastic unit in which the students participated two days a week for nine weeks was conducted during the third quarter of the 1967-68 school year. During the first six class periods, instruction was given on the basic skills in vaulting, on the high and low balance beam, and the uneven bars in the small gym. The students rotated

TABLE II

I.Q. SCORES FROM OTIS BETA MENTAL ABILITY TEST

	Students in Classes			Total Students	Leaders		High Gymnastic Ability Group
	Seventh (19)	Eighth (12)	Ninth (13)	Seventh Eighth Ninth (44)	Eighth (3)	Ninth (4)	(15)
N=							
Range	126-96	117-83	126-96	126-83	110-106	126-117	126-98
Mean	106	101	112	107	108	121	114

between the four stations in groups so that they had experience on each apparatus each class period. In addition to this, three class periods of instruction were given in floor exercise to the combined classes of both women physical education teachers. This was conducted in the large gym during the first three weeks of the nine week period. On the two days per week during the next five weeks, students were allowed concentrated practice in preparation for a test on the apparatus of their choice. The girls, following specific requirements, had to compose and perform a routine on the balance beam or uneven bars, or perform six out of ten vaults that were listed on the test. The routines and vaults in written form were required as part of the student's test and were due the same day the testing of the performance began. Individual instruction was given during this five week period while allowing students to progress at their own rate.

Many girls had participated in extra-curricular gymnastic activities in several elementary feeder schools and as a result were advanced in gymnastic techniques. These students and students who had participated in gymnastics at Wilson the two previous years were encouraged to teach movements and vaults which they knew to others. All students were taught to spot for one another and were encouraged to observe, then point out mistakes to fellow class members. Also, gymnastic magazines and books were available for the use of the girls as they tried to find new movements to include in their routines. Charts listing specific requirements for the tests, points to be judged on the different apparatus, and pictures of good form were posted on the bulletin board so students could review them from time to time. Also posted were names of movements on the beam and uneven bars and vaults over the horse in progression of difficulty.

Although judging good form had been discussed as skills on each apparatus were taught, one class period during the eighth week was spent in reviewing good form and points to be judged. Also, the procedures for students judging fellow students on their original routines or vaults were explained. The testing was completed in two class periods.

After the gymnastic unit was completed, the members of the sixth hour class who had not taken their test on vaulting, were allowed three class periods on consecutive days to practice vaults. The vaults taught are listed in Appendix B. During the fourth class period the investigator seated the students in a semi-circle around the landing area, reviewed the points to be judged in vaulting, and explained the procedures for the judging. The vaulting test requirements are listed in Appendix C. It was emphasized that the score sheet would be marked in pencil after each vault with no consultation with neighbors. The class then went through a trial testing procedure of three students at a time performing their first vault, then the second, then the third. Each girl called the name of her vault before she performed it. As the girls watched and waited for their turn, they practiced making a quick decision on the vaulter's form and called the score verbally. It had been determined that if three girls could be judged in two minutes on three vaults each, then one class period would be sufficient time to judge the entire class. During the fifth class period, the final judging took place and this proved to be true. Judging of thirty-nine students was completed in twenty-five minutes.

The class consisted of fifty-two girls two weeks before the judging took place, but on the judging day only thirty-nine students

performed their three vaults each. The reasons for this were as follows: three girls had withdrawn from school, one was expelled from school the day of the judging, one girl was absent, two girls were excused from performing because of absences during the practice periods, and six girls were excused because their large body size made vaulting difficult if not impossible. Also, the six girls were embarrassed to try in front of a group and it was felt that nothing would be gained by placing them in this situation. At this time it was decided to correlate the scores awarded by the eight girls who judged but did not participate with the five adult judges to see how the correlations would compare with the other groups.

Students comprising the high gymnastic ability group were selected by subjective teacher evaluation one week before the gymnastic unit was completed. They were selected because of the ability they exhibited on the apparatus upon which they were practicing and not necessarily upon their vaulting ability. Fifteen girls were selected, seven from the ninth grade, one from the eighth grade, and seven from the seventh grade.

Mrs. Gerry Ness, Mrs. Jurene Holcomb, Mrs. Betty Rummerfield, Mrs. Friday Leonard, and the investigator were selected as judges because of their training and experience in the area of physical education in general and in gymnastics in particular. Mrs. Ness, Mrs. Holcomb, and the investigator had been involved in teaching gymnastics on the junior high school level since 1963 when the activity was included in the Tulsa Public School curriculum. Also, Mrs. Ness and Mrs. Holcomb were instructors for several gymnastic in-service courses conducted in the Tulsa Public School system. Mrs. Rummerfield and Mrs. Leonard had served as volunteer judges for gymnastic meets conducted by the Tulsa Y.M.C.A.

A score sheet was designed to be used by both the students and the judges to record their scores. A sample score sheet is included in Appendix D. The point system used in this research was as follows: 5, excellent; 4, good; 3, average; 2, weak; 1, extremely weak; 0, no attempt made. The following six points in judging vaulting were stressed as the vaults were taught in the unit.

1. The performer executed a proper hurdle and spring on the take-off followed by a continuous movement through space.
2. The performer's body did not touch the horse.
3. The performer's legs were kept pressed together and straight with toes pointed on vaults requiring this and knees bent with toes pointed on others.
4. The performer maintained good head position. It was not held too far forward or backward.
5. The performer showed controlled balance, landing on the balls of the feet and finishing in attention position.
6. The performer had control of the entire body with good form throughout the vault for perfect execution.

In the treatment of the scores, the means for each performer and group were determined, then the standard deviation and correlation between all special groups and judges were computed. The t-ratios between the judges' mean scores and four selected groups were calculated. A sample computation for the standard deviation, correlation, and t-ratios between the judges and a specific group can be found in Appendixes F, G, and H.

The next step was to establish the basis for determining acceptable correlations. Donald K. Mathews in his book, Measurement in Physical

Education, stated a correlation falling within the range of .90 to .99 "indicates excellent agreement between the variables."¹ In physical education the majority of the tests show reliability and objectivity within this range. If the correlation range is from .80 to .89, the reliability and objectivity is considered only fair. "However, validity coefficients may be interpreted as very good from .80 to .85 and excellent above .85. As validity indicates the ability of the test to measure what it purports to measure, one cannot expect as high a coefficient as might be found for reliability and objectivity. Seldom do we obtain a higher than .89 validity coefficient."² Mr. Mathews also feels that correlations ranging from .70 to .79 could have acceptable validity, depending upon the complexity of the variables involved. Using this as a guide line, it was decided to use .80 or above in this research as indicating very good validity.

Computations of t-ratios were made between the means of the judges' scores and the means of the special groups' scores to test the hypothesis that the students' and the judges' ratings were not different. The five percent confidence level was accepted as indicating a significant difference between the means.

¹Donald K. Mathews, Measurement in Physical Education (Philadelphia and London, 1965), pp. 19-23.

²Ibid., p. 22.

CHAPTER IV

RESULTS

As the statistical calculations progressed, it was decided to compute additional correlations between the judges and the following three groups: seventh, eighth, and ninth grade students with an I.Q. of 115 and above; a high gymnastic ability group composed of the top sixteen students according to the highest judges' scores; and a high gymnastic ability group composed of the top sixteen girls according to the highest scores awarded by the investigator.

In considering possible evaluations of the judges' ratings, it was decided at this time to compute the standard deviations, means, and correlations between the ratings of one judge and the other four judges, and one judge and the total seventh, eighth, and ninth grade group. Inter-correlations between the judges' ratings were also determined.

The resulting means, standard deviations, correlations, and t-ratios between the special groups and the judges are found in Table III, page 21.

The mean for the five judges was 3.23, the lowest of all the groups, with a standard deviation of .50. This denoted that the judges graded a little more strictly than the student groups which ranged from 3.42 to 3.57. All standard deviations which ranged from .39 to .49 for the student groups were lower than that of the judges' .50. This indicated more variability in the judges' ratings than in the students' ratings.

TABLE III

STANDARD DEVIATIONS, MEANS, CORRELATIONS, AND t-RATIOS BETWEEN
 JUDGES' RATINGS AND SELECTED GROUPS' RATINGS

Groups (N)	Judges (5)	1 All seventh grade students (20)	2 All eighth grade students (12)	3 All ninth grade students (15)	4 Total 7, 8, and 9 grade students (47)	5 Physical education leaders (7)	6 High gymnastic ability selected by teacher (15)	7 High gymnastic ability top 16 according to judges' scores (16)	8 High gymnastic ability top 17 according to in- vestigator's scores (17)	9 I.Q. 110 or higher (17)	10 I.Q. 115 or higher (10)	11 Students who judged but did not perform (8)
Standard Deviation	.50	.41	.40	.41	.42	.39	.49	.43	.50	.44	.48	.47
Mean	3.23	3.42	3.53	3.51	3.48	3.57	3.50	3.51	3.54	3.53	3.50	3.42
Correlations with Judges' Scores		.85	.93	.85	.86	.83	.83	.83	.82	.88	.78	.65
t-Ratio					2.35*	3.30**	2.37*			2.78*		

*Significant at 5% level

**Significant at 1% level

Correlations with judges' scores of .85 and above represented excellent validity. The following groups fell into this category: twelve eighth grade students, .93; seventeen students with an I.Q. of 110 or higher, .88; fifteen ninth grade students, .85; and twenty seventh grade students, .85.

Correlations of .80 through .84 represented very good validity. The following groups fell into this category: sixteen girls in the high gymnastic ability group according to the top scores awarded by the five judges, .83; seven physical education leaders, .83; fifteen girls in the high gymnastic ability group selected by subjective teacher evaluation, .83; and seventeen girls in the high gymnastic ability group according to the top scores awarded by the investigator, .82.

These results indicated that students who had received some training in judging were capable of making valid judgements in side horse vaulting of fellow students.

The groups failing to have acceptable correlations were as follows: ten students with an I.Q. of 115 or higher, .78; and eight students who judged but did not perform, .65.

It appeared that the possession of a high I.Q. was no guarantee that students would make valid judgements. The mean of the I.Q. scores of the eighth grade group was 101, which was lower than the mean of 112 for the ninth grade, and 106 for the seventh grade. However, the eighth grade had the highest correlation. It was .93 as compared to .85 for the ninth grade and .85 for the seventh. Also the selected I.Q. group of 110 or higher had a correlation of .88 as compared with .78 of the I.Q. group of 115 or higher.

Correlations indicated that any grade level of junior high school students were capable of making valid judgements. The seventh grade group had .85, the ninth grade group .85, and the eighth grade group .93. Also, the total seventh, eighth, and ninth grade students had a correlation of .86. This signified that any grade level combination of junior high school students were capable of making valid judgements of fellow students in side horse vaulting.

The three groups that were composed of students demonstrating gymnastic ability had the following correlations with the judges' scores: a group of sixteen students as determined by the highest scores awarded by the five judges, .83; a group of fifteen students as determined by subjective teacher evaluation one week before the gymnastic unit was completed, .83; and the group of seventeen students as determined by the highest scores awarded by the investigator, .82. This indicated that students demonstrating gymnastic ability were capable of making valid judgements of fellow students in side horse vaulting although not better judgements than the total seventh, eighth, and ninth grade group. Even though four students selected by the investigator for the high gymnastic ability group scored a mean of 3.0 and two students scored a mean of 3.3, the group of fifteen girls had a correlation of .83. This was slightly higher than the correlation of .82 for the seventeen girls scoring the highest according to the investigator's judging, and the same as the .83 correlation of the group of sixteen girls scoring the highest according to the judges.

Two girls, numbers 5 and 43, selected by the investigator, scored 3.0 and did not appear on either the judges' high scoring group or the investigator's high scoring group. Three girls, numbers 33, 9, and 23,

did not appear on the investigator's selected group but were on the judges' high scoring group and the investigator's high scoring group. One girl, number 37, appeared on the judges' high scoring group but not on the investigator's selected group or high scoring group. Three girls, numbers 14, 6, and 8, appeared on the investigator's high scoring group but not on the judges' high scoring group or the teacher selected group. A list of the girls comprising the three groups and identified by a roll call number may be found in Appendix I.

The correlations of .83 for the sixteen highest scoring girls according to the judges, .83 for the fifteen girls demonstrating gymnastic ability and selected by the investigator, and .82 for the seventeen highest scoring girls according to the investigator, were below the correlations of .93 for the eighth grade, .85 for the ninth grade, and .85 for the seventh grade. This indicated that possessing gymnastic ability did not improve the ability of this group to make valid judgments in side horse vaulting of fellow students.

Correlations revealed that it was necessary to have experience in the gymnastic activity which is being judged. The group that judged but did not perform had a correlation of .65. The eight girls from this group had selected the beam as the apparatus upon which to practice for their test in the gymnastic unit. Therefore, their only experiences on the horse were during the introduction of the unit.

It appeared that only one girl was not judged fairly by the students. Means of the scores awarded her by all groups ranged from 3.3 to 3.7 with a mean of 3.5 as compared to a mean of 4.1 by the judges. The week after the judging was completed, the girl withdrew from school. At this time, the investigator discovered that the girl had not only

been suspected by the teachers of stealing but also by the students. It was felt that although she had been accepted on the surface, low scoring indicated that the students had reacted subconsciously.

In comparing one judge's ratings with the other four judges' ratings, two judges had correlations which indicated very good consistency. These correlations were .82 for the investigator and .80 for Betty Rummerfield. The correlations for the remaining three judges indicated somewhat less internal consistency although all were significantly related. These were Gerry Ness .67, Friday Leonard .64, and Jurene Holcomb .52. The standard deviations, means, and correlations are compiled in Table IV.

The correlations resulting from comparing one judge's ratings with the ratings of the total seventh, eighth, and ninth grade students were as follows: Betty Rummerfield .80, the investigator .78, Gerry Ness .65, Jurene Holcomb .68, and Friday Leonard .53.

This indicated that Betty Rummerfield had a very good correlation with the total seventh, eighth, and ninth grade students. The investigator's correlation of .78 was only .02 below this. The remaining three judges' correlations were slightly below this level but were significant. These results are recorded in Table V.

Inter-correlations were determined between each individual judge's scores. These are presented in Table VI. These correlations indicated Jurene Holcomb was less consistent in agreement with the other four judges. They also can be interpreted as showing that Betty Rummerfield and the investigator judged more consistently in agreement with the other three judges.

TABLE IV
 COMPARISONS BETWEEN ONE JUDGE'S RATINGS AND
 THE REMAINING FOUR JUDGES' RATINGS

Groups	1		2		3		4		5	
	LaRue Heath (Investigator)	Other 4 judges	Betty Rummerfield	Other 4 judges	Gerry Ness	Other 4 judges	Friday Leonard	Other 4 judges	Jurene Holcomb	Other 4 judges
Standard Deviation	.57	.51	.59	.44	.63	.51	.64	.46	.60	.54
Mean	3.09	3.28	3.78	3.11	3.35	3.24	2.87	3.34	3.08	3.29
Correlation	.82		.80		.67		.64		.52	

TABLE V
COMPARISONS BETWEEN ONE JUDGE'S RATINGS AND THE COMBINED
SEVENTH, EIGHTH, AND NINTH GRADE STUDENTS' RATINGS

Groups (N)	1		2		3		4		5	
	LaRue Heath (Investigator)	Combined 7, 8, and 9 (47)	Betty Rummerfield	Combined 7, 8, and 9 (47)	Gerry Ness	Combined 7, 8, and 9 (47)	Friday Leonard	Combined 7, 8, and 9 (47)	Jurene Holcomb	Combined 7, 8, and 9 (47)
Standard Deviation	.57	.42	.59	.42	.63	.42	.64	.42	.60	.42
Mean	3.09	3.48	3.78	3.48	3.35	3.48	2.87	3.48	3.08	3.48
Correlation	.78		.80		.65		.53		.68	

TABLE VI

STANDARD DEVIATIONS, MEANS, AND INTER-CORRELATIONS OF JUDGES' RATINGS

	1		2		3		4		5		6		7		8		9		10	
Group*	r 1-2		r 1-3		r 1-4		r 1-5		r 2-3		r 2-4		r 2-5		r 3-4		r 3-5		r 4-5	
Standard Deviation	.59	.57	.59	.63	.59	.60	.59	.64	.57	.63	.57	.60	.57	.64	.63	.60	.63	.64	.60	.64
Mean	3.78	3.09	3.78	3.35	3.78	3.08	3.78	2.87	3.09	3.35	3.09	3.08	3.09	2.87	3.35	3.08	3.35	2.87	3.08	2.87
Correlation	.78		.75		.53		.58		.67		.56		.63		.33		.59		.36	

- *1. Betty Rummerfield
- 2. LaRue Heath
- 3. Gerry Ness
- 4. Jurene Holcomb
- 5. Friday Leonard

Table III, page 21, contains the four t-ratios that were computed. The t-ratios between judges' mean scores and selected special group mean scores were as follows: the total seventh, eighth, and ninth grade students, 2.35; the subjective teacher selected high gymnastic ability group, 2.37; the I.Q. group of 110 or higher, 2.78; and the physical education leaders, 3.30. Any t-ratio 2.30 or greater was significant at the five percent level with over thirty degrees of freedom. Any t-ratio 3.0 or greater was significant at the one percent level with over thirty degrees of freedom. These t-ratios indicated that the judges graded differently from the students even though the scores between the judges and the special groups correlated by going up and down at the same time. Inspection was made of the following means: 3.23 for the judges' ratings, 3.48 for the total seventh, eighth, and ninth grade students, 3.57 for the physical education leaders, 3.50 for the teacher selected high gymnastic ability group, and 3.53 for the I.Q. group of 110 or higher. This revealed that the judges consistently scored lower than the students.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The investigator wanted to devise a testing program for junior high school gymnastics that could be used in a classroom situation involving large numbers of students. The testing would be planned to take a minimum amount of time and produce satisfactory results. It was felt that this could be done if the students were used as judges to make evaluations of fellow class members rather than the use of teacher evaluation.

This research was undertaken to determine if junior high school students were capable of making valid judgements of fellow class members in side horse vaulting. The sub-problems were to determine if any particular groups were superior to others in their ability to judge. To solve this problem, product-moment correlations were computed between the scores awarded by five competent adult gymnastic judges and special combinations of junior high school girls.

According to the resulting correlations and findings discussed in Chapter IV, it was concluded that the four hypotheses of the research were acceptable.

1. Students in the seventh, eighth, and ninth grade gymnastic classes, who had previously received some instruction in judging, were capable of making valid judgements of side horse vaulting of fellow students.

2. Student leaders in the eighth and ninth grade gymnastic classes, who had previously received some instruction in judging, were capable of making valid judgements of side horse vaulting of fellow students.
3. Students in the seventh, eighth, and ninth grade gymnastic classes demonstrating high gymnastic ability, who had previously received some instruction in judging, were capable of making valid judgements of side horse vaulting of fellow students.
4. Students in the seventh, eighth, and ninth grade gymnastic classes with an I.Q. of 110 or higher, who had previously received some instruction in judging, were capable of making valid judgements of side horse vaulting of fellow students.

In addition to the four acceptable hypotheses, the results indicated that it was necessary for the students to have experience in the event being tested before they were able to make valid judgements.

It can further be hypothesized from these results that, since students were capable of making valid judgements in side horse vaulting, they can make valid judgements in other gymnastic activities if they have experience in those activities.

It was concluded that the sub-groups selected according to grade level, I.Q., high gymnastic ability, or physical education leaders did not judge more validly than the group as a whole.

It was concluded that the judges scored consistently lower than the students as indicated by significant *t*-ratios.

Further study is recommended concerning the application of the same research procedures in a different gymnastic event to ascertain if similar results can be obtained.

Based upon the preceding conclusions, it is recommended that the procedures be established for students to judge fellow class members in several gymnastic events. These events should include side horse vaulting, balance beam, uneven bars, and free exercise.

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APPENDIX A

OTIS BETA MENTAL ABILITY TEST SCORES AND MEANS OF SCORES AWARDED BY THE
JUDGES AND TOTAL SEVENTH, EIGHTH, AND NINTH GRADE STUDENTS

Ninth Grade				Eighth Grade				Seventh Grade						
		IQ	Mean ^a	Mean ^b			IQ	Mean ^a	Mean ^b			IQ	Mean ^a	Mean ^b
Leaders				Leaders				Class Members						
1*	B.C.	117	3.6	3.8	14*	M.C.	109	3.3	4.1	26*	C.B.	116	3.9	4.2
2.	L.D.	118	3.3	3.6	15.	L.E.	110	3.1	3.5	27.	M.C.	110	3.6	3.3
3.	L.G.	126	4.0	4.1	16.	D.L.	106	2.8	3.0	28.	M.C.	113	***	***
4.	C.S.	125	3.4	3.7					29.	C.C.	112	3.5	3.6	
Class Members				Class Members				30.	D.E.	107	4.0	3.9		
5.	N.B.	107	3.1	3.4	17.	P.A.	117	3.7	3.7	31.	J.F.	126	3.7	3.9
6.	T.C.	117	3.2	3.6	18.	J.C.	104	***	***	32.	W.F.	98	2.7	3.0
7.	M.G.	118	3.7	4.0	19.	V.C.	83	2.5	2.8	33.	T.G.	106	3.4	3.6
8.	M.H.	104	3.3	3.7	20.	C.F.	85	***	***	34.	D.H.	101	***	***
9.	V.H.	96	3.5	3.5	21.	K.M.	114	2.5	3.1	35.	C.H.	114	***	***
10.	T.H.	100	3.1	3.7	22.	K.O.	89	2.5	2.8	36.	K.J.	98	4.1	3.5
11.	L.M.	113	2.8	3.2	23.	K.S.	94	3.5	3.5	37.	V.L.	102	3.5	3.5
12.	S.P.	119	4.1	4.3	24.	C.C.	95	***	***	38.	T.M.	96	3.0	3.5
13.	D.P.	96	2.3	3.0	25.	R.Z.	106	3.2	3.7	39.	P.P.	98	3.1	3.2
								40.	C.P.	111	3.1	3.8		
								41.	A.R.	100	2.8	2.9		
								42.	R.R.	---	2.8	2.9		
								43.	S.R.	---	2.3	2.7		
								44.	B.S.	105	3.1	3.2		
								45.	C.S.	102	3.0	3.3		
								46.	B.Y.	104	***	***		
47.	P.C.	---	***	***					49.	S.C.	64	***	***	
48.	G.T.	---	***	***										

* Identifies the student by roll call number

^aMeans of scores awarded by judges

^bMeans of scores awarded by the total seventh, eighth, and ninth grade group

***Judged but did not perform

APPENDIX B

SKILLS FOR THE HORSE

1. Mount - land on the knees on the horse with upspring dismount
2. Mount to a squat position on the horse
 - a. Dismount straight
 - b. Dismount Flying T
 - c. Dismount squat
 - d. Dismount straddle
3. Mount to a straddle on the horse
4. Mount to a wolf position on the horse
5. Fence mount - Right and left
6. Squat vault
7. Straddle vault
 - a. 1/2 twist
 - b. 3/4 twist
8. Flank vault - Right and left
9. Wolf vault - Right and left
10. Rear vault - Right and left
11. Front vault - Right and left
12. Forward roll
13. Head-spring
 - a. Tuck
 - b. Pike
 - c. Twist
14. Hand-spring
 - a. Tuck
 - b. Pike
 - c. Twist
15. Thief vault

APPENDIX C

VAULTING TEST

The test consists of performing any three vaults from either Group I or Group II. In Group I, dismounts may be selected from the following list: squat jump, flying T, or straddle jump. In Group II, vaults may be performed with the following variations: straight, half twist, to the right or to the left.

Group I

1. Squat on
2. Wolf on
3. Straddle on

Group II

1. Squat vault
2. Wolf vault
3. Flank vault
4. Front vault
5. Rear vault
6. Straddle vault

APPENDIX D

SAMPLE SCORE SHEET

SCORE SHEET

- 5 = Excellent
- 4 = Good
- 3 = Average
- 2 = Weak
- 1 = Extremely weak
- 0 = No attempt made

Name _____

Grade Level 7th 8th 9th

P.E. Leader yes no

Gymnastic Ability _____

Name of Performer	Vaults			Name of Performer	Vaults		
	1	2	3		1	2	3
1.				16.			
2.				17.			
3.				18.			
4.				19.			
5.				20.			
6.				21.			
7.				22.			
8.				23.			
9.				24.			
10.				25.			
11.				26.			
12.				27.			
13.				28.			
14.				29.			
15.				30.			

APPENDIX E

FORMULAS USED IN COMPUTATIONS

Standard Deviation

$$\sigma_x = \sqrt{\frac{\sum x^2}{N} - M_x^2}$$

Correlation

$$r = \frac{\frac{\sum xy}{N} - M_x M_y}{\sigma_x \sigma_y}$$

t-ratio

1. Standard error of each mean

$$\sigma_{M_1} = \frac{\sigma}{\sqrt{N-1}}$$

2. Standard error of the difference

$$\sigma_{\text{difference}} = \sqrt{\sigma_{M_1}^2 + \sigma_{M_2}^2}$$

3. t-ratio = $\frac{M_1 - M_2}{\sigma_{\text{difference}}}$

APPENDIX F

SAMPLE COMPUTATION OF STANDARD DEVIATION

Eighth Grade Group

$$\sigma_y = \sqrt{\frac{\Sigma Y^2}{N} - M_y^2}$$

$$\sigma_y = \sqrt{\frac{492.22}{39} - (3.53)^2}$$

$$\sigma_y = \sqrt{12.6210 - 12.4609}$$

$$\sigma_y = \sqrt{.1601}$$

$$\sigma_y = .40$$

APPENDIX G

SAMPLE COMPUTATION OF CORRELATION JUDGES

GROUP--TOTAL EIGHTH GRADE GROUP

$$r = \frac{\frac{\sum xy}{N} - M_x M_y}{\sigma_x \sigma_y}$$

$$r = \frac{451.90 - (3.23)(3.53)}{(.50)(.40)}$$

$$r = \frac{11.5872 - 11.4019}{.2000}$$

$$r = \frac{.1853}{.2000}$$

$$r = .927 \text{ or } .93$$

APPENDIX H

SAMPLE COMPUTATION OF t-RATIO JUDGES GROUP--TOTAL
SEVENTH, EIGHTH, AND NINTH GRADE GROUP

1. Standard deviation of each mean

$$\begin{array}{llll} X_1 = \text{Judges (5)} & M_1 = 3.23 & \sigma = .50 \\ X_2 = \text{7th, 8th, 9th (47)} & M_2 = 3.48 & \sigma = .42 \end{array}$$

2. Standard error of each mean

$$\sigma_{M_1} = \frac{\sigma}{\sqrt{N-1}} = \frac{.50}{\sqrt{39-1}} = \frac{.50}{6.16} = .0812$$

$$\sigma_{M_2} = \frac{\sigma}{\sqrt{N-1}} = \frac{.42}{\sqrt{39-1}} = \frac{.42}{6.16} = .0682$$

3. Standard error of the difference

$$\begin{aligned} \sigma_{\text{difference}} &= \sqrt{\sigma_{M_1}^2 + \sigma_{M_2}^2} \\ \sigma_{\text{difference}} &= \sqrt{(.0812)^2 + (.0682)^2} = \sqrt{.00659 + .00466} = \\ &= \sqrt{.01125} = .106 \end{aligned}$$

4. t-ratio

$$\frac{M_1 - M_2}{\sigma_{\text{difference}}} = \frac{3.48 - 3.23}{.106} = \frac{.25}{.106} = \text{t ratio } \boxed{2.35}$$

APPENDIX I

MEANS OF THE HIGH GYMNASTIC ABILITY GROUPS

- Group I Sixteen girls scoring the highest according to the means of the scores awarded by the five judges.
- Group II Fifteen girls selected by the investigator to comprise the high gymnastic ability group. The means of the scores awarded by the investigator are recorded.
- Group III Seventeen girls scoring the highest according to the means of the scores awarded by the investigator.

Group I			Group II			Group III		
Roll*			Roll*			Roll*		
No.	Call No.	Mean	No.	Call No.	Mean	No.	Call No.	Mean
1.	36	4.1	1.	36	4.0	1.	36	4.0
2.	12	4.1	2.	12	4.0	2.	12	4.0
3.	30	4.0	3.	30	4.0	3.	30	4.0
4.	3	4.0	4.	3	3.7	4.	3	3.7
5.	26	3.9	5.	26	3.7	5.	26	3.7
6.	31	3.7	6.	31	3.0			
7.	7	3.7	7.	7	3.7	6.	7	3.7
8.	17	3.7	8.	17	3.3	7.	17	3.3
9.	1	3.6	9.	1	3.7	8.	1	3.7
10.	28	3.6	10.	28	3.7	9.	28	3.7
11.	29	3.5				10.	29	3.3
12.	37	3.5						
13.	9	3.5				11.	9	3.7
14.	23	3.5				12.	23	3.7
15.	4	3.4	11.	4	3.0			
16.	33	3.4	12.	33	3.7	13.	33	3.7
			13.	2	3.3	14.	2	3.3
			14.	5	3.0			
			15.	43	3.0			
						15.	14	3.7
						16.	6	3.3
						17.	8	3.3

*Identifies the student by roll call number

VITA

LaRue H. Heath

Candidate for the Degree of
Master of Science

Thesis: COMPARISON OF STUDENTS' AND COMPETENT GYMNASTIC JUDGES'
EVALUATION OF SIDE HORSE VAULTING

Major Field: Physical Education

Biographical:

Personal Data: Born in Norman, Oklahoma, August 25, 1927, the daughter of Mr. and Mrs. L. E. Haskell.

Education: Graduated from Robert E. Lee High School, Jacksonville, Florida, in May, 1945; attended University of Oklahoma from January, 1946, to January, 1950, and received the Bachelor of Science degree with a major in Physical Education; completed the requirements for Master of Science degree from Oklahoma State University in July, 1968.

Professional Experience: Physical Education teacher in Tulsa, Oklahoma, at Lanier Elementary, 1950-1952, Riley Elementary, 1954, Wilson Junior High School, 1955-1968; Tulsa Westside Y.M.C.A., Day Camp Program Director, summers of 1960-1962; Chicago Ravenswood Y.M.C.A., Senior Girls' Camp Director, summer of 1964; Water Safety Instructor, 1947-1968.