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A Design for a Proposed Skill Proficiency Test in Tumbling and Apparatus for Male Physical Education Majors at the University of North Dakota

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A DESIGN FOR A PROPOSED SKILL PROFICIENCY TEST IN TUMBLING AND APPARATUS FOR MALE PHYSICAL EDUCATION MAJORS AT THE UNIVERSITY OF NORTH DAKOTA

by

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This thesis submitted by J. Patrick Harris in partial fulfillment of the requirements for the Degree of Master of Science in the University of North Dakota is hereby approved by the Committee under whom the work has been done.

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ABSTRACT

The purpose of this study was to design an instrument that would measure the tumbling and apparatus skill proficiency of male physical education majors of the University of North Dakota.

Two groups were used in the study. An experimental group of fifteen subjects, which was taking the required tumbling and apparatus course five times weekly; and a control group of ten subjects that had taken the same class the semester before, were utilized in this study.

The two groups were given the initial test for purposes of determining item validity. The experimental group was also given a retest to determine test item reliability.

Two statistical comparisons were made: (1) a within group comparison between the initial test and retest means given to the experimental group, and (2) a comparison between the means on the initial test of both groups in the areas tested. The null hypothesis was assumed in analyzing the significance of the difference between the means, of the within group comparison for reliability, at the .05 level. The .10 level of significance was used to determine item validity in the between group comparison.

The results of the within group comparison showed a significant difference in eight of the twenty-two items tested, and therefore these items were rejected. The between group comparison indicated six items to be significant.

It was concluded that the six items found statistically significant in both between group comparisons were reliable and valid test items for measuring tumbling and apparatus skill proficiency. Therefore, these test items made up the final test battery.

CHAPTER I

THE PROBLEM AND ITS SCOPE

Introduction

At the University of North Dakota all male physical education majors have been required to take a course in tumbling and apparatus. The course has been designed basically as a laboratory-type class with very little emphasis on teaching methodology. The writer felt the course was a must for those with poor tumbling and apparatus background. The writer believed two courses of tumbling and apparatus should be required of physical education majors at the University. The first course would be basic and emphasize tumbling and apparatus skills for the beginner. The second course would contain advanced skills and emphasize teaching methods and techniques. It was theorized that all men physical education majors would take this second course.

Statement of the Problem

The problem was to design an instrument, to be given at the beginning of each semester, that would indicate the tumbling and apparatus proficiency level of the students enrolled in the class. The purpose for the design of such an instrument was two-fold. One, it would point out the more advanced students who might gain more in a

theory course rather than a basic skills course. Two, it would point out weaker students and therefore aid the instructor in the determination of those who might need help and consideration as the course progressed.

Delimitations

The study was limited to 25 male physical education majors at the University of North Dakota, Grand Forks, North Dakota. Of the subjects, 17 were freshmen, six were sophomores and two were seniors. Two test groups were used in this study.

A test-retest was administered to the experimental group on four consecutive days during the regular tumbling and apparatus class period. Each class period ran for forty-five minutes. The control group was given the test in a two hour block during an evening. It was theorized that the performance of these subjects might have been affected by the group's apparent loss of physical conditioning and strength. These subjects had completed the course, which contained a good deal of physical conditioning, the previous semester.

Defintions of Essential Terms

Tumbling and Apparatus - The areas of gymnastics concerned with tumbling, or the following apparatus equipment: high bar, parallel bars, rings, trampoline, and side horse.

Proficiency - Being skilled or well advanced in an art. In this study it would be skill proficiency in the area of tumbling and apparatus.

Competency - Being properly qualified to achieve a goal. In this study it would be competency in the area of tumbling and apparatus.

Male Physical Education Majors - Any male student enrolled in the College of Education or the College of Science, Literature and Arts, with physical education as his proposed or declared major.

Need for the Study

Dr. Ralph Wickstrom, head of physical education at Ripon College in Wisconsin stated:

> There is a dire need in the field of physical education for the kind of master teacher who is capable of doing a good job of teaching a wider variety of physical activities. The master teacher of whom we speak is one who has command of the materials and teaching techniques. This teacher has the ability to demonstrate the basic skills that are taught. This number is applicable to a woefully small number of the teachers in the physical education department.[1]

Often young people learning to be physical education teachers are convinced that it was not necessary to be able to perform a skill in order to be able to teach it. By such rationalization they overlooked the experience of learning the skills and the insights that were acquired as a result. They were also unaware of the difficulty new teachers sometimes have in communicating their instructions, unaware of the great help a demonstration could be to them in teaching and to the students in learning.[2] In summarizing the above, one might say one picture is worth a thousand words. The writer found this to be very true in teaching gymnastics.

Over the years proficiency examinations have been widely utilized in education. Physical educators have used them for purposes

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[1]Ralph L. Wickstrom, "The Lost Art of Teaching," Journal of Health, Physical Education, and Recreation, 32:8 (November, 1961), p. 38.

[2]Ibid.

of homogenous grouping within a class, as a part of a final grade for a course, and placement in advanced classes. Such tests revealed strengths and weaknesses of each student. When the instructor had reviewed the data he was able to place students in classes from which they would receive the most benefit.

The writer felt that highly skilled students in tumbling and apparatus were wasting time in a beginning required course. Could their time be better utilized in other ways or in other courses? If this needless waste of time occurred at the University of North Dakota was it the same in other institutions? Perhaps these highly skilled men could be used as student leaders. They could help teach and demonstrate. Perhaps a more advanced course was needed for these men.

There seemed to be a need, first of all, for some type of proficiency examination that would determine the tumbling and apparatus ability of all men physical education majors. Once a reliable instrument was found, perhaps this information could lead to new and different courses which would be helpful to future teachers of physical education. With these thoughts in mind, the writer felt there was sufficient and valid reason for the study.

Review of the Related Literature

The enlightened, cultured citizen, and the competent teacher or leader, according to the Educational Policies Commission, is one who achieves and sustains high professional competence.[3] This statement is in agreement with those made by Dr. Wickstrom earlier.

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[3]Raymond Albert Snyder and Harry Alexander Scott, Professional Preparation in Health, Physical Education and Recreation (New York: McGraw-Hill Book Company, Inc., 1954), p. 68.

The American Association of Health, Physical Education and Recreation viewed comprehensive examinations in the following manner. This organization held a National Conference in Professional Preparation in 1962. One of the general objectives proposed that professional personnel in physical education should acquire a mastery of knowledge and skills unique to their field. If this was done, the institution and prospective employer could be assured each graduate possessed at least an acceptable level of skill and knowledge in a variety of activities upon graduation. Comprehensive examinations presented a practical means of assuring not only that this objective had been obtained but also that this competence existed at the point of completion of the undergraduate program.[4]

Related more specifically to the physical education program, there are diagnostic tests, prognostic tests and proficiency tests which have a part in the guidance of students. Skills tests were designed for diagnostic purposes in identifying weak areas. Such batteries should be comprehensive to sample as many aspects of a sport as possible.[5]

Proficiency tests are beginning to receive more attention. Proficiency in skills and in knowledge might excuse a student from some sport so that he could enroll for activities in which he was less proficient. This concept could be appropriately used in colleges.

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[4]Association of Health, Physical Education and Recreation Committee, "Development of Patterns and Standards of Selection and Recruitment of Competent Women for Professional Preparation in HPER," Journal of Health, Physical Education and Recreation, 34:4 (April, 1963), 28, 72.

[5]Harold M. Barrow and Rosemary McGee, A Practical Approach to Measurement in Physical Education (Philadelphia: Lea and Febiger, 1966), p. 35.

It was feasible that certain levels of achievement in physical skills should be attained for promotion just as levels of achievement were considered in other subjects within the curriculum.[6]

Dr. Meyers, of State University of New York, had the following to say about competency examinations:

> Because attention has recently been directed to competency examinations and proficiency examinations, in higher education generally and physical education specifically, a clarification of the terms appears desirable. In essence, competency examinations and proficiency examinations are regarded as synonymous. They purport to disclose the level of skill and knowledge possessed at a particular time by students in a given field. Furthermore, comprehensive examinations are merely competency or proficiency examinations given upon completion of an undergraduate program to attest to competency in the major field or selected phase or phases of it. These comprehensive examinations afford means of assuring that the graduate has retained skill and knowledge pertaining to the major field, if desired, they may be designed to reveal whether effective integration and application of this skill knowledge can be made.[7]

A questionnaire study conducted by Dale O. Nelson brought out the following points about proficiency evaluation in physical education activities at the college level. Nelson discovered that almost all respondents favored a physical proficiency test. The test was a requirement for students preparing to teach physical education. In some cases respondents gave the impression that physical proficiency was separate from knowing how to teach and how to analyze skills. On the other hand, many others felt the ability to perform and demonstrate was an important part of teaching. If one could perform well, one should have the ability to demonstrate and analyze skills. Nelson

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[6] Ibid., pp. 35-36.

[7] Carlton R. Meyers, "Comprehensive Examinations," Journal of Health, Physical Education and Recreation, 37:2 (February, 1966), p. 37.

concluded that performance, ability, and good teaching methods in the area of aquatics, dance, games and relays, individual and dual sports, team sports, combatives, gymnastics and adapted activities should be required and tested for in college physical education major programs.[8]

Latchaw and Brown found that certain conditions should be considered in the construction of skills tests. The test should meet the following conditions whatever its primary purpose: (a) it should measure important skills; (b) it should be similar to the real situation in which it is used; (c) it should allow for the performance of only one person at a time; (d) it should be economical of time, space and equipment; (e) it should have clear and simple directions and accurate scoring procedures; (f) it should discriminate among the different abilities being measured.[9]

In designing a gymnastics skill proficiency test the writer had to consider the evaluation process as well as the test construction and administration. In the evaluation of gymnastic movements certain points should be considered:

1. The purpose must be known and agreed upon with the other judges, if any (often in the teaching situation the teacher is often the only judge), and with the performer (in the school teaching situation the pupils must be aware of the goal--in most circumstances).

2. The purpose known, basic points of judgement can be put under headings, e.g.:

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[8]Dale O. Nelson, "Proficiency Evaluation in Physical Education Activities," Physical Educator, 22:2 (May, 1965), p. 65.

[9]Marjorie Latchaw and Camille Brown, The Evaluation Process in Health Education, Physical Education and Recreation (New Jersey: Prentice-Hall, Inc., 1962), p. 199.

a) Rhythm and flow
b) Ability to reach end positions
c) Achievement of anatomical and kinesiological purpose
d) Stillness
e) Balance
f) Flexibility
g) Strength
h) Spring
i) Relaxation of muscles not in use
j) Ease
k) Bearing
l) Correctness of position
m) Beauty of performance (a total impression).

3. These basic points can be:

a) Tabulated under headings with rating scales, so that either a total mark or profile may be given
b) With the experienced judge, whose training will tend to integrate the analyses of all these points, a total mark without breakdown may be given.
c) An error method may be used, in which the performer is assumed to have, say, eighty per cent of available points; points are subtracted from errors, and any special virtues are marked up.[10]

A combination of "a" and "b" were used by the writer in this study.

There is no mathematically objective way of eliminating prejudice in evaluating gymnastic movements. There are obvious traps, such as letting the beauty of the performance be confused with the beauty of the performer, or letting one's own particular foibles dominate, but the basic problem is knowing thoroughly what is being attempted.[11]

In searching through the related literature the writer was able to find only one example of a gymnastic competency test. This

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[10]Philip A. Smithells and Peter E. Cameron, Principles of Evaluation in Physical Education (New York: Harper and Brothers, 1962), p. 378.

[11]Ibid., p. 379.

test was the gymnastic portion of a more complete test battery given to physical education majors at the University at New York at Buffalo. The complete competency test battery included performance examinations in a) rhythms, a dance, b) wrestling, c) track and field, d) tennis, e) soccer, f) basketball, g) tumbling, h) apparatus, and i) swimming and diving. The students were given the comprehensive performance examination during their senior year in college. A passing grade was required in each area, for graduation.

Tumbling (choose any six of the series below in addition to "9" which is compulsory for everyone.)

1. Three neck springs in series
2. Headspring
3. Back flip with any type of pitch assistance
4. Handstand
5. Headstand with stiff leg pull up
6. Handspring (bent or straight arm)
7. Three cast ups in series
8. Backward roll to headstand
9. "Compulsory for all" any combination of six stunts in a fast continuous series.

Apparatus

1. Series of eight stunts on the trampoline
2. Series of seven stunts on the parallel bars
3. Six individual stunts on the horizontal bar
4. Six vaults on the horse or Swedish box
5. Two stunts on the side horse.[12]

Summary of Related Literature

In conclusion it would seem that proficiency tests are becoming more popular every day. The literature presented here should help the reader realize the significance of such a test.

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[12]"Health, Physical Education and Recreation Senior Comprehensive Examination for Men," (School of Education, State University of New York at Buffalo), p. 2. (Mimeographed.)

CHAPTER II

METHODOLOGY

Introduction

The design of the proficiency examination in tumbling and apparatus proved to be rather interesting. The review of literature revealed a large number of activities which might be used in such a test battery. Which activities would best discriminate between the men with few skills and those with many? The writer looked elsewhere for help and advice; it was found in the form of two experienced gymnastic teachers in the Division of Men's Physical Education at the University of North Dakota (Len Marti[1] and Frank Zazula[2]). With their valuable assistance and the aid of the New York State University Comprehensive Examination as a guide, the writer was able to design a battery of twenty-two items. It seemed these activities would measure a student's proficiency in the area of tumbling and apparatus.

The actual construction of the battery took into consideration the factors of test construction as mentioned earlier by Latchaw and

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[1]Len Marti: Athletic Director at the University of North Dakota for twenty-one years; three year gymnastic letterman at the University of Minnesota; Head Gymnastic Coach at the University of North Dakota for twenty-one years; instructor of tumbling and apparatus #104 for eleven years.

[2]Frank Zazula: Three year college gymnastic letterman at Akron, Ohio; Instructor of tumbling and apparatus #104 for ten years; taught gymnastics and tumbling in the United States Preflight at Chapel Hill, North Carolina; on the University of North Dakota Physical Education Staff for ten years.

Brown. The battery was designed to meet the following conditions: (a) it measured important skills; (b) it was similar to the actual class situation; (c) it allowed for the performance of only one person at a time; (d) it was economical of space and equipment; (e) it had clear and simple directions with accurate scoring procedures; (f) it discriminated among the different abilities being measured. The decisions, in each case, were made after discussion and deliberation with Mr. Marti and Mr. Zazula. The maximum point values assigned to each test item were set according to that item's degree of progression. For example, the forward roll to head balance was at an easier progression level than the more difficult front handspring. Therefore, the forward roll to a head stand was given a value of seven points and the front handspring the higher point maximum of nine points. The following were the items finally chosen to measure tumbling and apparatus skill of men majoring in physical education at the University of North Dakota.

Tumbling

Item	Skills Measured	Points
1. Forward roll to head balance	Forward tumbling Balance	7
2. Backward roll to extension	Backward tumbling	7
3. Front handspring	Forward rotation	9
4. Three cartwheels	Lateral movements in a series	9

Apparatus Equipment

Rings

5. Double leg cut-off dismount	Backward rotation Dismount	7

Item	Skills Measured	Points
6. Muscle-up to L-seat above the rings	Physical strength and conditioning Balance	9
7. Single leg cut-on	Forward rotation	7
	Parallel Bars	
8. Back uprise, shoulder balance, forward roll	Basic command of swinging movement Balance Forward rotation	7
9. Double leg cut and catch mount	Flexibility Reflex action	9
10. Shoulder kip from arm support, swing, front dismount	Forward rotation Dismount Well-balanced	9
	High Horizontal Bar	
11. Cast to kip-up	Timing critical factor Proper swing	9
12. Cast to single knee mount	Mounting movement Forward rotation	7
13. Front pull-over cast, back hip circle	Timing and physical strength Backward rotation	7
	Low Horizontal Bar	
14. Single leg circle forward	Forward rotation	7
15. Rear vault	Transfer of body weight Balance	7
16. Front hip circle	Forward rotation	9
	Side Horse	
17. Front vault	Balance and timing	7
18. Right leg full circle left	Balance and timing Transfer of body weight	7
19. Scissors (regular)	Balance and timing Transfer of body weight	9

Item	Skills Measured	Points
	Trampoline	
20. Back, front, seat, feet	Forward rotation Change of direction Backward rotation	7
21. All fours drop, forward somersault	Timing Forward rotation	9
22. Back to back	Forward rotation 1/2 twist	9

A complete description of each item is given in Appendix A.

Establishment of Administration and Procedure of Test Battery

It was highly advised that some preliminary work be conducted after the final selection of test items. This study was conducted with five freshmen students from the experimental group. The writer scored the subjects' performance to establish judging procedures. Such administrative details and problems as placement of apparatus equipment, instructions, time element, scoring and routine were noted and resolved.

Description of Subjects

The participants in this study were male physical education majors at the University of North Dakota.

Control Group: This group was composed of ten men who had taken the tumbling and apparatus course during the previous semester of the 1966-1967 school year. There were five freshmen, three sophomores, and two seniors in this group.

Experimental Group: This group was composed of fifteen men who were enrolled in the same course during the spring semester of 1966-1967. The group contained twelve freshmen and three sophomores.

Test Administration

The test was administered in the apparatus gymnasium of the University of North Dakota Fieldhouse. This gymnasium contained all the apparatus equipment necessary for the various test items.

The entire test-retest battery was administered to the experimental group in four consecutive forty-five minute testing sessions. The test was administered during the regular class period. Since the skills test was given only once to the control group the test was completed in one two-hour session.

Because all the test items were taught in the regular class the subjects had, in essence, received some practice. For this test the items were demonstrated and fully explained by the writer before the first performer made an attempt to do the skill. The tests were scored by a "panel of judges." This panel consisted of two judges--Gordon Longmuir[3] and Bill Weldon.[4] Scoring details and procedures were thoroughly discussed with both judges prior to the test to provide greater scoring consistency and accuracy. To aid the judges in scoring the total point value each item was divided into form points and execution points. This helped lessen the possibility of scoring confusion with regard to beauty of performance as compared to beauty of the performer.[5] For example, a subject could receive

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[3]Gordon Longmuir: Three years letterman on the University of North Dakota Gymnastic team. 1963-66. Gymnastic judge.

[4]Bill Weldon: Three years letterman on the University of North Dakota Gymnastic team. 1962-1965. Gymnastic judge.

[5]Philip A. Smithells and Peter E. Cameron, Principles of Evaluation in Physical Education (New York: Harper and Brothers, 1962), p. 379.

maximum execution points and a zero score for form. However, the form score should in no way influence the performer's execution points. This sytem also helped lessen the possibility of bias. The form value went up one point with a one point increase in the execution value.

Statistical Procedure

This study assumed the null hypothesis in analyzing the difference between the initial test and retest of the experimental group. The null hypothesis[6] asserts that there is no difference between the two mean scores, and that the difference found between the sample means is a chance difference and is accidental and unimportant.

The "t" technique for testing the significance of the difference between group means derived from correlated scores and from small samples was used for this study since this test was used for discriminatory purposes. This test determined the difference between the means and the estimate of sampling error of the mean difference. This ratio was expressed as "t" and was checked for significance in a "t" table. The value of "t" is proportional to the degree of freedom (N-1) allowed in determining the relationship between the mean difference and the estimate of sampling error of the mean difference.

For this study it was decided to retain the null hypothesis at or beyond the .05 level of confidence for the within group comparison of the experimental group. This means that if this study were repeated one hundred times, ninety-five per cent of the studies would have similar results.

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[6]Quinn McNemar, Psychological Statistics (New York: John Wiley & Sons Inc., 1949), p. 225.

For the between group comparison of the three subgroups, the .10 level of confidence was used. The "t" technique for testing the significance of the difference between group means was again used here. Since the experimental and control groups were combined the degree of freedom equaled (N-2) for a non-related group comparison.

CHAPTER III

ANALYSIS OF THE DATA

The purpose of this study was to design a tumbling and apparatus skills test. This test was to be used to discriminate between the men with few skills and those with many.

This investigator selected the null hypothesis as a means of analyzing the significance of difference between the means of the test-retest. This hypothesis asserts that there is no true difference between two population means, and that the difference found between sample means is therefore, accidental and unimportant.[1] In determining the intragroup significance of the experimental group, the significance of the difference between the means of the initla test and the retest was determined with the "t" test for significance. This is called the related "t" ratio. This "t" ratio showed, as a result of dividing the actual mean difference by the standard error of the mean, the level of significance established in the "t" table. To determine at what level the "t" ratio fell, the formula (N-1) was applied to find the degrees of freedom for the intragroup comparison. The level of significance assumed by this investigator, after computation of the data and consultation with his committee, was at the .05 level.

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[1]Henry E. Garrett, Statistics in Psychology and Education (New York: Longmans, Green & Co., 5th ed., 1958), p. 213.

Results of Intragroup Comparison for the Experimental Group

The intragroup or within group comparison indicated which test items were reliable. A related "t" ratio established the significance of difference between the means. This was computed by comparison of the results of each item tested of the initial test and retest within the experimental group.

Only the test items that showed significant "t" ratios are discussed in this chapter and therefore the null hypothesis was rejected in each case. However, complete data are given in Table 1, page 21. Test items are referred to by number rather than their complete title in these tables. A complete key to all the test items may be found in Chapter II, pages 11-13 and Appendix A, pages 39-48.

Item Two

Backward Roll to Extension - The experimental group had a mean score on the initial test of 4.400 and a mean score of 3.533 on the retest. This produced a mean difference of 0.867 for both tests. The "t" value of 3.697 for the experimental group was significant at the .05 level of criterion for 14 degrees of freedom.

Item Four

Cartwheels - The experimental group had a mean score on the initial test of 5.000 and a mean score of 4.333 on the retest. This produced a mean difference of 0.667 for both tests. The "t" value of 2.993 for the experimental group was significant at the .05 level. With 14 degrees of freedom, "t" was 2.14.

Item Five

Double leg Cut-off Dismount - The experimental group mean score on the initial test of 4.500 and the mean score of 3.767 on the retest produced a mean difference of 0.733 for both tests. The "t" value of 2.943 for the experimental group was significant at the .05 level.

Item Six

L-Seat Above the Rings - The experimental group mean score was 3.867 on the initial test. The retest mean was 3.000. The two tests showed 0.867 difference between the initial and the retest. A "t" value of 2.303 was significant at the .05 level. The "t" value for 14 degrees of freedom was 2.14.

Item Seven

Single Leg Cut On - The experimental group mean score was 2.367 on the initial test. The retest mean was 4.900. The two tests showed 2.533 difference between the initial and the retest. A "t" value of 4.579 was significant at the .05 level for 14 degrees of freedom.

Item Fifteen

Rear vault - The experimental group mean score was 3.300 on the initial test. The retest mean was 4.500. The two tests showed -1.200 difference between the initial and retest means. A "t" value of -2.857 was significant at the .05 level for 14 degrees of freedom.

Item Eighteen

Right leg full circle left - The initial test mean for the experimental group was 3.400 and the mean score for the retest was 4.267.

The experimental group had a mean score difference of -0.867. After computation of the "t" value, which was -2.749, the criterion of 2.14 for 14 degrees of freedom showed significance at the .05 level.

Item Nineteen

Scissors - The initial test mean score for the experimental group was 1.900 and the mean score for the retest was 3.033. The experimental group had a mean score difference of 1.133. After computation of the "t" value, which was 3.035, the criterion of 2.14 for 14 degrees of freedom showed significance at the .05 level.

Results of Intergroup Comparison of Groups I, II, and III

The data were analyzed to determine the discriminatory value of each item. Because the previously mentioned items showed significant "t" values they were assumed to be unreliable and therefore, these items were eliminated from the test battery.

The writer then combined the groups and ranked each subject according to his total mean score for both judges, which can be found in Table 3, page 23. After ranking the subjects they were divided into three separate groups. By dividing the subjects into groups a comparison could be made between those highly skilled in tumbling and apparatus and those of average ability. A comparison of those with average ability was made with those of low ability. The cut off was made according to natural "breaks" in the scores. Group I was composed of the four top subjects on the rank order scale. It might be of interest to note that of these four subjects, three were varsity gymnasts and the other had several years of previous gymnastic experience.

TABLE 1

"t" AND THE SIGNIFICANCE OF DIFFERENCE IN THE INTRAGROUP COMPARISON OF THE EXPERIMENTAL GROUP FOR DETERMINING ITEM RELIABILITY

Item Compared	"t" value of Experimental Group	
1	0.752	not significant
2	3.697	significant
3	1.673	not significant
4	2.993	significant
5	2.943	significant
6	2.303	significant
7	4.579	significant
8	0.653	not significant
9	1.391	not significant
10	0.901	not significant
11	1.140	not significant
12	0.283	not significant
13	0.723	not significant
14	0.235	not significant
15	2.857	significant
16	0.748	not significant
17	1.062	not significant
18	2.749	significant
19	3.035	significant
20	0.103	not significant
21	1.244	not significant
22	1.704	not significant

TABLE 2

MEAN SCORES IN TESTS OF SUBJECTS IN EXPERIMENTAL GROUP

Item	Number of Subjects	Initial Test	Retest
1	15	5.033	5.200
3	15	4.267	3.733
8	15	4.667	4.800
9	15	1.233	1.800
10	15	3.467	3.833
11	15	2.433	2.733
12	15	2.700	2.600
13	15	3.567	3.367
14	15	3.300	3.433
16	15	2.900	3.233
17	15	4.800	4.967
20	15	3.600	3.633
21	15	4.133	4.467
22	15	3.367	3.833

Group II was composed of seventeen subjects. Group III was made up of four subjects who ranked at the bottom of the sale.

TABLE 3

RANK ORDER OF SUBJECTS' MEAN SCORE FROM BOTH JUDGES

	Subject No.	Points
	1	170
GROUP I	2	144.5
	3	127
	4	115
	5	109
	6	104
	7	102
	8	101
	9	91
	10	90.5
	11	89.5
	12	89
GROUP II	13	86.5
	14	85
	15	84
	16	83
	17	78.5
	18	74.5
	19	68
	20	63.5
	21	60.5
	22	55
GROUP III	23	54
	24	44.5
	25	21

Significant Test Items for Intergroup Comparison

After the subjects had been divided into three groups, the writer compared the mean score of Group I to the mean score of Group II. This produced a non-related "t" ratio. Likewise, Group II was compared to Group III which produced another non-related "t" ratio.

This step was performed for each of the 14 test items that proved to be reliable.

After further consultation with the committee the .10 level of significance was used for the discriminatory aspect of the study. This gave the writer a "t" of 1.714 with 23 degrees of freedom. The degrees of freedom were determined by the formula (N-2). This level was chosen because it permitted a lower "t" value which was still acceptable. It was felt that for the sake of discrimination, if correct predictions could be made, 90 times out of 100 that this would be acceptable.

Item One

Forward Roll to Head Balance - Group I had a mean score of 6.75 on Item One. Group II had a 5.47 mean score and Group III had a 4.00 mean score. The intergroup comparison between Group I and Group II produced a "t" ratio of 2.008 at the .10 level of confidence. The between group comparison with Group II and III provided a "t" ratio of 2.032. Both items proved to be significant at the .10 level of confidence.

Item Three

Front Handspring - The mean score for Group I was 7.50, Group II had a mean of 4.59 and Group III had a mean score of 4.00. The comparison of Group I and Group II produced a "t" ratio of 2.708. The value of "t" with 23 degrees of freedom at the .10 level was 1.714. The "t" ratio for this comparison proved to be significant.

In comparing Group II and Group II a "t" ratio of 1.265 was produced. This value was not significant at the .10 level, and thus the item was not acceptable.

Item Eight

Back uprise, shoulder balance, front roll - Group I had a mean score of 6.75, Group II had a score of 5.18 and Group III had a mean of 1.75.

In comparing Group I and Group II a "t" ratio of 3.685 was produced. The comparison of Group II with group III had a "t" value of 3.972. Both "t" ratios proved to be significant at the .10 level, therefore the item was acceptable.

Item Nine

Double leg cut and catch mount - The mean scores for Group I was 7.25. Group II had a score of 1.76 and Group III had a score of 1.75.

The comparison between Group I and Group II produced a "t" ratio of 4.223. This ratio was significant at the .10 level for 23 degrees of freedom.

The intergroup comparison between Group II and Group III provided a "t" ratio of 0.012 which was not significant at the .10 level of confidence.

Item Ten

Shoulder kip from arm support - The mean score for Group I was found to be 7.50. Group II had a mean of 4.12 and Group III a mean score of 1.75.

The "t" ratio for the intergroup comparison of Group I and Group II was 3.880. In comparing Group II and Group III a "t" ratio of 2.666 was produced. Both "t" values proved to be significant at the .10 level with 23 degrees of freedom.

Item Eleven

Cast to kip up - Group I had a mean score of 7.75 for item eleven. A mean score of 3.59 was produced for Group II. Group III had a mean score of 1.00.

The "t" ratio for the comparison of Group I and Group II was 3.543. Intergroup comparison of Group II and Group III produced a "t" ratio of 2.240 at the .10 level of confidence. Both ratios proved to be significant at this level with 23 degrees of freedom.

Item Twelve

Cast Single Knee Mount - The mean score for Group I was 5.00, Group II had a 3.53 mean, and Group III a mean score of 0.50.

In comparing Group I and Group II a "t" ratio of 1.035 was produced at the .10 level of confidence with 23 degrees of freedom, which proved to be non-significant.

In the Group II and Group III comparison a "t" value of 2.295 was calculated. This ratio was significant at the .10 level.

Item Thirteen

Front pull-over, cast, back hip circle - A mean score of 6.25 was produced for Group I. Group II had a mean of 3.88 and Group III had a mean of 2.00.

In the intergroup comparison of Group I and Group II a "t" ratio of 2.723 was produced. The "t" ratio for the comparison of Group II and Group III was 2.052. Both ratios proved to be significant at the .10 level of confidence with 23 degrees of freedom.

Item Fourteen

Single leg circle forward - Group I had a mean value of 4.75. Group II had a mean of 3.59 and Group III produced a mean of 1.75.

In the between group comparison of Group I and Group II a "t" ratio of 0.718 produced. The "t" ratio for Groups II and III was 1.166. Both "t" values were not significant at the .10 level of confidence with 23 degrees of freedom.

Item Sixteen

Front Hip Circle - This item produced a mean score of 4.00 for Group I. Group II had a mean of 3.00 and Group III a mean of 0.50.

In the intergroup comparison of Group I and Group II a "t" ratio of 0.792 was produced. Comparison of Group II and Group III produced a "t" of 2.264. The "t" ratio for Group I and Group II comparison was not significant at the .10 level with 23 degrees of freedom. The "t" in this case was 1.71. Group II and Group III produced a "t" ratio which was significant at the above stated criterion levels.

Item Seventeen

Front Vault - The mean score for Group I was 6.50. Group II had a mean score of 5.12 and Group III had a mean score of 4.75.

In comparing Group I and Group II a "t" value of 3.035 was obtained. This value proved to be significant at the .10 level with 23 degrees of freedom.

The intergroup comparison between Group II and Group III provided a "t" value of 0.815. This value was not significant since it fell below the "t" value of 1.71 set at the .10 level.

Item Twenty

Back, front, seat, feet - Group I had a mean score of 6.50. Group II had a mean of 4.53, with Group III producing a mean score of 2.25.

In the between group comparison of Group I and Group II a "t" value of 3.207 was produced. The "t" value for Group II compared to Group III was 3.442. Both values proved to be significant at the .10 level of confidence with "t" being 1.71 for 23 degrees of freedom.

Item Twenty-one

All-fours drop, front somersault - The mean score for Group I was 7.75, with Group II producing a mean of 4.65. Group III had a mean of 3.50.

The intergroup comparison between Group I and Group II produced a "t" value of 4.021. This value proved to be significant at the .10 level of confidence with "t" being 1.71 for 23 degrees of freedom.

In comparing Group II with Group III a "t" value of 1.314 was produced. This was not significant at the .10 level of confidence.

Item Twenty-two

Back to back - The mean score for Group I was 7.25. Group II had a mean of 3.41 and Group III a mean score of 2.00.

When comparing Group I to Group II a "t" value of 3.348 was produced which was significant at the .10 level, "t" being 1.71 at 23 degrees of freedom.

The intergroup comparison of Group II and Group III produced a "t" value of 1.342 which was not significant at the .10 level.

TABLE 4

"t" RATIOS FOR INTERGROUP COMPARISONS OF GROUPS I, II AND III FOR ITEMS

Item No.	Groups Compared	"t"	p
1	1 and 2	2.008	significant
1	2 and 3	2.032	significant
3	1 and 2	2.708	significant
3	2 and 3	1.265	not significant
8	1 and 2	3.685	significant
8	2 and 3	3.972	significant
9	1 and 2	4.223	significant
9	2 and 3	0.012	not significant
10	1 and 2	3.880	significant
10	2 and 3	2.666	significant
11	1 and 2	3.543	significant
11	2 and 3	2.240	significant
12	1 and 2	1.035	not significant
12	2 and 3	2.295	significant
13	1 and 2	2.723	significant
13	2 and 3	2.052	significant
14	1 and 2	0.718	not significant
14	2 and 3	1.166	not significant
16	1 and 2	0.792	not significant
16	2 and 3	2.264	significant
17	1 and 2	3.035	significant
17	2 and 3	0.815	not significant
20	1 and 2	3.207	significant
20	2 and 3	3.442	significant
21	1 and 2	4.021	significant
21	2 and 3	1.314	not significant
22	1 and 2	3.348	significant
22	2 and 3	1.342	not significant

CHAPTER IV

DISCUSSION

This study was undertaken to design a tumbling and apparatus skills test for male physical education majors at the University of North Dakota. A major objective was to provide a battery that met the requirements of test reliability and validity. It was therefore essential to determine which items were not reliable and then which of the remaining items would discriminate, at a significant level, the highly skilled student from the student with few skills.

Reliability of Entire Test

Test reliability was determined by a test-retest situation within the experimental group. The data, from a comparison of the means, pointed out eight test items that were unreliable at the .05 level of confidence. The writer felt that the factors of strength and physical condition were a major reason for the unreliability of these items.

Item two was a skill which proved to be unreliable. The backward roll to extension was felt to be unreliable because of the strength factor involved. Another test item in the same group was item four, the cartwheels. Here balance was a major factor. It was a more critical factor here than on any of the previous skills.

Physical strength and conditioning was a big factor in items five, six and seven. The writer can only theorize that many

of the subjects were in poor physical condition; therefore, this may have affected their timing and execution. The fact that the control group received the test in one, two-hour session should be noted as physical fatigue may have entered in here.

Item fifteen, the rear vault on the low horizontal bar, also proved to be unreliable. It was believed that this was an item presenting a psychological barrier for many subjects. The subjects tended to "freeze" or tighten up in the performance of the skill and were unable to execute it properly. The top four ranked subjects had very little difficulty performing this skill.

Test item eighteen, the right leg full circle left on the side horse, was indicated to be unreliable. Balance and proper shifting of the body weight was critical here. It was also felt that the side horse was an area of general weakness for most of the subjects. The subjects with a solid background in tumbling and apparatus tended to be more consistent on this piece of apparatus. This was generally true throughout the test battery. Item nineteen, scissors, was found to be too difficult to be reliable for the general population of the class. The highly skilled even found it difficult to execute properly.

Item Validity of the 14 Reliable Test Items

The next problem was to determine if the remaining fourteen items discriminated between the three different groups. The three groups were arbitrarily established according to the natural "breaks" in the rank order scale. In each of the remaining fourteen items the mean of the top group was compared with the mean of the middle

group and the middle group's mean in turn compared to the bottom group's mean. The top group was not compared with the bottom group simply because it was felt that this was too great a spread in the skill levels of each group. Therefore such a comparison would show all the items to be discriminatory.

The following items all proved to be significant at the .10 level of confidence for both intergroup comparisons: (a) Item One, the forward roll to head balance; (b) Item Eight, the back uprise, shoulder balance, forward roll on the parallel bars; (c) Item Ten, the shoulder kip from arm support and front dismount on the parallel bars; (d) Item Eleven, a cast to kip-up on the high bar; (e) Item Thirteen, the front pullover, back hip circle on the high bar; and (f) Item Twenty, the back, front, seat, feet on the trampoline. They, therefore, measure the performer's ability to execute the skills involved on that item. These test items met the standards for test reliability and validity and were acceptable as the final test battery items.

The following items all proved to be non-significant at the .10 level for one or both intergroup comparisons.

Item three, the front handspring, proved to be significant in the Group I and Group II comparison; however it failed to be significant in the Group II and Group III intergroup comparison. Therefore, this item did not meet the standards required for a valid test item as it would not discriminate sufficiently between the different skill levels. It must be rejected from the test battery. With some modification this item might be made valid. It should be noted that

the front handspring is an advanced tumbling skill and consequently gave the middle group and bottom group a difficult time in proper execution.

Item nine, the double leg cut and catch on the parallel bars, produced a significant "t" value at the .10 level for the intergroup comparison of Group I and Group II. However, it failed to show significance in the comparison of Group II and Group III. The means seemed to indicate that a high degree of skill was required to perform this item properly. The middle and bottom group had the most difficulty in execution. There was a large mean score spread between Group I and Group II. The double leg cut and catch was therefore rejected as a valid and reliable test item.

Item twelve, the single knee mount on the high horizontal bar, was found to have a non-significant "t" value in the intergroup of comparison of Group I and Group II. It was felt that, because this is a highly stressed and practiced skill, the split between the top and middle group would not be so great. Here it was found that the top group excelled mostly in form of execution and was equaled by the middle group in execution. There was a significant "t" value in the Group II and Group III comparison. This item, however, would have to be revised to meet the discriminatory limits. It cannot be used as a valid and reliable test item.

Item fourteen, the single leg circle forward on the low horizontal bar, had non-significant "t" values for both intergroup comparisons. Because balance was extremely critical here the means were quite low. There appeared to be a large gap between the bottom group and the middle group rather than the top and middle. This

might be explained by the fact that very few form points were given and thus the judging emphasis was mainly on execution. Because of this, the middle group was able to keep up with the top group better. Since it failed to meet the necessary discriminatory level, it cannot be used as a valid and reliable test item.

Item sixteen, front hip circle on the low horizontal bar, had a non-significant "t" value in the intergroup comparison of Group I and Group II. However, a significant "t" ratio was indicated in the comparison of Groups II and III. Since this skill is very difficult, with exact timing critical, the mean scores were quite low. It was found that execution points were more often awarded than form points on this item. The skill was one which the student either could or could not do. There was no half way point for the most part. The item failed to meet the discriminatory level in both cases and was therefore assumed to be an invalid test item and was rejected.

Item seventeen, the front vault on the side horse, proved to have a significant "t" value when comparing Group I and Group II. In the comparison of Group II and Group III a non-significant "t" value was found. The mean scores for this item were all quite high which indicated the skill was relatively easy. It was felt that Group I excelled in form and therefore managed to score somewhat higher than Groups II and III. The front vault failed to meet the requirements of test validity in the comparison of Groups II and III and therefore has to be rejected as a non-discriminatory test item.

Item twenty-one, the all fours drop, front somersault on the trampoline, proved to be significant within Groups I and II but non-significant in Groups II and III. It was felt that the lower two

groups had the most difficulty in proper execution rather than in form. Since it was a requirement that the subject land on his feet out of the front somersault, execution points were subtracted for failure to do so. This factor alone seemed to account for the mean score spread between Group I and Group II. Since the item did not meet the standards of discrimination it was rejected as a final test item.

Item twenty-two, the back to back on the trampoline, was also found to be significant in the intergroup comparison of Groups I and II. The "t" value for the Group II and Group III comparison was non-significant for the back to back. As in item twenty-one there was a major mean score spread between Group I and Group II. Likewise, it was theorized that the execution points accounted for this, as the item was a difficult one. Since the item failed to meet the standards for test validity it had to be rejected.

The items that met the acceptable standards for item reliability at the .05 level of confidence and item validity were items: one, eight, ten, eleven, thirteen, and twenty. These items proved to be discriminatory at the .10 level of confidence with twenty-three degrees of freedom.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This study was undertaken to design a reliable and valid tumbling and apparatus skill proficiency test battery for male physical education majors at the University of North Dakota. The test was composed of twenty-two test items. There were four test items in the area of tumbling. Of the remaining eighteen items, there were three for each piece of apparatus equipment. The apparatus equipment included: the rings, parallel bars, high horizontal bar, low horizontal bar, side horse, and trampoline.

Two groups were selected for purposes of determining test reliability. An experimental group of fifteen subjects and a control group of ten subjects volunteered to participate in the study. The experimental group was enrolled in the physical education major tumbling and apparatus class for men. The class met five times a week for a period of 45 minutes. The control group had been enrolled in the same class the semester prior to the test administration. Both groups were given an initial test. The experimental group was given a retest to determine item reliability. The raw scores were used from the initial test of both groups and the retest of the experimental group. The experimental group's raw scores were computed by determining the difference

between the means of the initial test and the retest. The null hypothesis was assumed in testing the significance of difference between the means at the .05 level of confidence.

To determine item validity the total mean scores of all 25 subjects were ranked. Three groups were then established according to the natural breaks in the table of rank order. An intergroup comparison was computed between the top and middle groups and the bottom and middle groups. The .10 level of confidence was found to be acceptable for such a test battery and therefore was used.

Conclusions

It can be concluded that because of a significant "t" value at the .05 level of confidence the following test items proved to be unreliable: (a) Item Two, backward roll to extension; (b) Item Four, cartwheels; (c) Item Five, double leg cut-off dismount on the rings; (d) Item Six, L-seat above the rings; (e) Item Seven, single leg cut on; (f) Item Fifteen, the rear vault on the side horse; and (h) Item Nineteen, the scissors on the side horse.

Items: three, nine, twelve, fourteen, sixteen, seventeen, twenty, and twenty-one were found to be non-significant in the intergroup comparisons at the .10 level of confidence. Therefore, these items were rejected as reliable and valid test items.

The following items proved to be both reliable and valid test items: (a) Item One, the forward roll to head balance; (b) Item Eight, the back uprise, shoulder balance, front roll on the parallel bars; (c) Item Ten, the shoulder kip from arm support for the parallel bars; (d) Item Eleven, the cast to kip-up on the high bar; (e) Item Thirteen,

the front pullover, cast back hip circle on the high bar; and (f) Item Twenty, back front, seat, feet, on the trampoline. These items were acceptable as final test battery items.

Recommendations

Since the study was limited to 25 subjects, this investigator recommends the test battery be given to a larger sample to further substantiate the results.

It is also recommended that a study be conducted to examine and revise the test items that failed to meet the criteria for discrimination at the .10 level.

The writer recommends that the test battery be limited or condensed into a test consisting of one reliable and valid test item per piece of apparatus equipment. An item correlation could be conducted after designing such a test battery.

It is also recommended that this test be given at the beginning of each semester so that its use as a proficiency examination is more effective. This will provide an indication of the student's tumbling and apparatus skill proficiency level before any degree of learning has taken place. In so doing, it may also be used as an instrument for classifying the students into different skill groups.

APPENDIX A

TEST ITEM DESCRIPTION

1. Forward Roll to Head Balance - Take a squat position, place hands on mat about shoulder width apart. Place chin on chest, lean forward, push with the feet and bend the arms. Allow the back and shoulders to touch the mat first as the roll is executed and continue to roll over on the back. When the shoulders touch the mat, take the hands from the mat and grasp the shins and pull the body into a tight tuck. Roll forward in this tight tuck up to the feet.[1] From this position begin the second skill. Stay in the tuck position and place hands ahead of the feet about shoulder width apart. Place head on the mat and raise the feet off the mat straightening the body to an erect position with all the weight borne on the hands and head.
2. Back Extension - This is a variation of the backward roll in which the performer momentarily passes through a handstand position and snaps the legs down to the floor. As the performer pushes with the hands the arms are fully extended and the feet shoot upward to a momentary handstand. In the handstand position, bend the knees slightly and snap the legs down from the waist. As the legs are snapped down, push with the hands so the whole body will be completely off the mat. Finish in a standing position.[2]

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[1]Newton C. Loken and Robert J. Willoughby, Complete Book of Gymnastics (Englewood Cliffs, N. J.: Prentice-Hall Inc., 1961), p. 20.

[2]Ibid., p. 22.

3. Front handspring - Take a good run and skip on the right foot and bring the left foot forward. Place the left foot on the mat, and bend forward at the waist and place both hands about 24 inches ahead of the left foot. Kick the right foot overhead followed by the left. As the feet are being carried overhead, the arms should be held straight and the eyes trained on a spot about six inches in front of the hands. As the body passes through the handstand position, push off the mat with the shoulders and wrists without bending the arms. Continue on over to the feet and land with the feet flexed.[3]

4. Cartwheels - The description which follows is done to the left. Start with the left side facing the mat with legs and arms outstretched and apart as in the spokes of a wheel. Rock to the right side by placing the body weight on the right leg and lift the left foot off the floor. Then rock back to the left by placing the body weight on the left leg. With the momentum established by this rocking motion, bend to the left side at the waist and place the left hand on the mat about two feet to the side of the left foot. Force the right leg overhead and simultaneously push off the mat with the left leg. As the feet approach the handstand, place the right hand on the mat about shoulder width from the left hand. Keep arms straight and the head craned back so that the eyes are trained on a spot about 12 inches in front of and between the hands. At this point, the body is in a handstand with the legs held straight and

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[3]Ibid., pp. 25-26.

apart and the back arched slightly. As the body passes through the handstand from the side, bring the right foot down on the line established by the left foot and hand and bend to the right at the waist. The left foot will follow to the mat and one finishes facing the same direction as at the start.[4]

Rings

5. Double Leg cut-off dismount - Grasp the rings and bring both legs up into a pike position between the rings. Swing the legs forward, downward and backward. From here the performer returns to a pendulum motion called a (beat). Using all the momentum created by this action swing both legs up to a semi-piked position. At a point just before reaching a vertical position spread legs wide apart to the outside of the rings and hands. At this point release the rings just prior to the time when the thighs touch the arms. Snap the head back and continue backward rotation landing on the feet with knees slightly flexed.
6. Muscle-up to L-seat above rings - The performer brings the muscle-up by hanging from the rings with a "false grip." In the false grip the performer grasps the rings in such a manner that it runs from a line from the index finger across the palm to the heel of the hand on the little finger side. The elbows should be almost touching with the arms flexed in a 45° angle because of the unnatural position of the rings. From this position the performer does a pull-up until reaching a point just above the rings. Then continue on upward with a push-up until arms are

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[4]Ibid., p. 22.

locked and the performer is supported above the rings. At this point it is required that the legs be raised to a 90° angle. This position is commonly called the L-seat.

7. Single leg cut-on - Grasp the rings and bring both legs up into a pike position between the rings. Swing forward with both legs and at the same time spread them apart so as to cut one leg between a ring and a hand. Release the ring with the hand and allow the leg to pass between and then regrasp the ring. Keep arms in a slightly flexed position as this will give added control to the stunt. The head and shoulders should be rolled up towards the rings before cutting on for a safer and easier execution of the stunt.[5]

Parallel Bars

8. Back uprise, shoulder balance, front roll - From an upper arm support position, swing back and forth a few times. On the completion of the back-swing, pull hard with the hands and lift the hips upward. Continue the pull which brings the shoulders forward and finish in a straight arm support position. A fairly high swing helps in the accomplishment of this stunt.[6]

From the straight arm support position in the middle of the bars, lean or swing forward and place the upper arms on the bars with the elbows out to the side. Raise the hips and extend the legs over the head. Assume the shoulder balance position with the back arched, head up, and toes pointed with the elbows out to

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[5]Ibid., p. 128.

[6]Ibid., p. 117.

the side.[7]

From the shoulder stand drop the head forward and release the grasp on the bars. Overbalance by piking at the hips at the same time the head is brought forward. As momentum starts to roll forward extend the arms for full support and continue through with the forward roll.

9. Double leg cut and catch mount - Stand on the mats facing the end of the bars and grasp them with the hands. Jump toward a straight arm support position. As the body moves forward, separate the legs and pass the left leg outside the left hand and the right leg outside the right hand. After the legs have passed over the bar, regrasp the bar and finish in a straight arm position.[8]

10. Shoulder kip from arm support - From an upper arm support position in the middle of the bars, raise the legs forward between the bars and over the head so that the body is in a pike position. From this pike position, extend the legs forward, and at the same time pull hard with the arms. Finish in a straight arm position above the bars.[9]

From the straight arm position above the bars swing once or twice. As the body reaches the peak of the backward swing and the legs are above the bars, push hard with the left arm and swing the body over the right bar so that the front part of the body is closest to the bar. After passing over this bar, drop toward

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[7] Ibid., p. 116.

[8] Ibid., p. 115.

[9] Ibid., pp. 118-119.

the mat and grasp the bar with the left hand as the right hand releases the grip. Land on the mat with the left hand grasping the closest bar. This will steady the landing.[10]

Horizontal Bar

11. Cast to kip-up - In this item primary emphasis is placed upon the kip. The performer may obtain preliminary swing action by a cast-out or by any means desired. In doing the kip swing on the bar and towards the front end of the swing arch the body. After reaching the end of the front swing bring the feet up towards the bar. When the feet reach the bar and the hips are underneath it on the back swing, forcefully extend the legs upward and pull hard with the arms. This kick and pull should kip the body up and forward into a straight arm support position above the bar.[11]

12. Cast to single knee mount - In doing the single similar to the kip the body is arched on the front end of the swing. After reaching the end of the front swing bring the leg between or to the outside of the hands hooking the back of the knee to the bar. Swing the free leg forward and downward. Pull with the arms and allow the body to swing up to a support position on top of the bar.[12]

13. Front pull-over, cast, back hip circle - Stand and face the bar and grasp it in a regular grip. Pull the chest to the bar and kick the legs up and over the top of the bar. Continue to pull

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[10] Ibid., p. 113.

[11] Ibid., p. 103.

[12] Ibid., p. 100.

with the arms and finish in a front support position.[13]

From the front support position begin the cast. Flex the hips slightly and then extend the legs backwards away from the bar slightly. Then allow the legs to swing back toward the bar and as the thighs strike the bar, pike the body and continue the legs under and around to the other side. Pull with the arms and complete the circle of the body around the bar. Finish in a front support position again.[14]

Low Horizontal Bar

14. Single leg circle forward - Be sure the hands are in a reverse grip position. From a single knee position hook the back of the knee to the bar. Lock that ankle behind the knee of the other leg. Push up and away from the bar at the beginning and lead with the head as the circle is tried. Pull strongly with the arms at the bottom of the swing. Continue circle and finish on top of the bar.[15]

15. Rear Vault - Upon taking off, grasp the bar with the hands and lift the legs to the left. This stunt can be done to the right side also. Turn the body so that the back side passes over the horse in a sitting position. Release the left hand first and then the right in passing over the bar. After dropping with the right hand grasp the bar with the left hand to steady the landing on the far side of the horse. Finish facing in the direction

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[13] Ibid., p. 101.

[14] Ibid., p. 101.

[15] Ibid., p. 100.

parallel to the bar with the left side of the body nearest the bar.[16]

16. Front hip circle - Start from a front support position. Straighten the arms and elevate the chest so that the thighs are resting on the bar. Fall forward. As the chest passes below the level of the bar, pull hard with the arms and continue the circle around the bar. Shift the wrists at the end so that the front support position is reached again. Try to keep the body in contact with the bar throughout the circle.[17]

Side Horse

17. Front vault - Upon taking off with a run bounce off a beat board grasp the pommels with the hands; turn toward the horse and lift the legs to the left passing them over the top of the horse toward the other side. The front of the body should face the horse throughout the stunt and an attempt should be made to force an arch in the body while passing over the top of the horse. As the body passes over the horse and starts toward the mat, drop the left hand first, hold on with the right and proceed to land on the mats with the right side of the body closer to the horse.[18]

18. Right leg full circle left - From a front support position swing the right leg over the right end of the horse and over the pommel and continue it toward the left end of the horse and over the left side of the horse to the original starting position. As the

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[16] Ibid., p. 80.

[17] Ibid., p. 102.

[18] Ibid., pp. 79-80.

leg passes over the pommels the hand on that pommel is released to permit it to pass by. At the same time the weight is shifted to the opposite arm until the hand is replaced on the pommel again.[19]

19. Scissors (regular) - Start from a scissors position in the saddle with the right leg in front and left leg in back. Swing both legs slightly forward and then back toward the right hand, shifting the weight of the left arm. Release the right hand and as the legs rise above the horse, cut the left leg forward and right leg back in a scissors action. As the reverse scissors is completed and the legs swing down into the saddle regrasp the right pommel with the right hand. Finish in a scissors position in the saddle with the left leg forward and right leg back.[20]

Trampoline

20. Back, front, seat, feet - Start with a few preliminary bounces, land on the bed in a supine position with the legs straight and vertically inclined. Place the hands on either the thigh or free of the legs but near them. Keep the chin on the chest.[21] From a back drop reverse direction with rotation now going forward and land on the bed in a prone position. Extend the arms forward with the elbows extended sideward and the palms of the hands downward. The following contact points should land simultaneously: palms, forearms, abdomen, and thighs.[22]

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[19]Ibid., p. 89.

[20]Ibid., p. 91.

[21]Ibid., p. 66.

[22]Ibid., p. 66.

From the front drop rotation is again reversed to a backward direction and land on the bed in a sitting position with legs fully extended forward so the entire back of the legs contact the canvas simultaneously. The trunk is slightly inclined backward from the vertical. Hands are flat on the bed six to eight inches in back of and to the side of the hips, with the fingers pointed toward the feet with the fingers slightly bent. Finish by returning to the feet.[23]

21. All-fours drop, front somersault - After a few preliminary bounces drop to the hands and knees simultaneously with the head up. Upon landing on the hands and knees look into the direction of the flip and then grasp the shins with the hands and pull the knees to chest into a tight tuck. Hold the tuck until the somersault is almost completed and then extend the legs downward towards the bed leaving the arms up and forward of the chest.[24]

22. Back to back (cradle) - After preliminary bounces this stunt begins from a backdrop landing. As the body bounces forward (as if rolling over to a front drop position) one arm is thrust across the waist and the head is turned into the direction of the arm thrust and a half twist is executed. The stunt continues into a backdrop landing and finishes by landing on the feet.[25]

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[23] Ibid., p. 65.

[24] Ibid., p. 70.

[25] Ibid., p. 70.

MEAN SCORES FOR GROUPS I, II AND II FOR RELIABLE TEST ITEMS

Item No.	Group No.	Mean Score
1	1	6.75
1	2	5.47
1	3	4.00
3	1	7.50
3	2	4.59
3	3	3.25
8	1	6.75
8	2	5.18
8	3	1.75
9	1	7.25
9	2	1.76
9	3	1.75
10	1	7.50
10	2	4.12
10	3	1.75
11	1	7.75
11	2	3.59
11	3	1.00
12	1	5.00
12	2	3.53
12	3	0.50
13	1	6.25
13	2	3.88
13	3	2.00
14	1	4.75
14	2	3.59
14	3	1.75
16	1	4.00
16	2	3.00
16	3	0.50
17	1	6.50
17	2	5.12
17	3	4.75

GROUP MEAN SCORES FOR TEST ITEMS

Item No.	Group No.	Mean Score
20	1	6.50
20	2	4.53
20	3	2.25
21	1	7.75
21	2	4.65
21	3	3.50
22	1	7.25
22	2	3.41
22	3	2.00

TUMBLING AND APPARATUS PROFICIENCY TEST

NAME_____ YEAR IN SCHOOL_____

DIRECTIONS: For evaluation circle the number which indicates the performers score in areas of form and execution respectively. Leave totals until all testing has been completed.

TUMBLING ( ) Taking #104 presently ( ) Had #104

1) Forward roll to head balance
   form: 1 2
   execution: 1 2 3 4 5 TOTAL:
2) Backward roll to extension
   form: 1 2
   execution: 1 2 3 4 5 TOTAL:
3) Front handspring
   form: 1 2 3
   execution: 1 2 3 4 5 6 TOTAL:
4) Cartwheel (three)
   form: 1 2 3
   execution: 1 2 3 4 5 6 TOTAL:

APPARATUS

Rings

5) Double leg cut-off dismount
   form: 1 2
   execution: 1 2 3 4 5 TOTAL:
6) Muscle-up to L-seat above rings
   form: 1 2 3
   execution: 1 2 3 4 5 6 TOTAL
7) Single leg cut-on
   form: 1 2
   execution: 1 2 3 4 5 TOTAL:

Parallel Bars

8) Back uprise, shoulder balance, front roll
   form: 1 2
   execution: 1 2 3 4 5 TOTAL:
9) Double leg cut and catch mount
   form: 1 2 3
   execution: 1 2 3 4 5 6 TOTAL:
10) Shoulder kip from arm support, swing, front dismount
   form: 1 2 3
   execution: 1 2 3 4 5 6 TOTAL:

Horizontal Bar

   form: 1 2 3
   execution: 1 2 3 4 5 6 TOTAL:
12) Cast to single knee mount
   form 1 2
   execution: 1 2 3 4 5 TOTAL:
13) Front pull-over, cast, back hip circle
   form: 1 2
   execution: 1 2 3 4 5 TOTAL:

Low Horizontal Bar

14) Single leg circle forward
   form: 1 2
   execution: 1 2 3 4 5 TOTAL:
15) Rear vault
   form: 1 2
   execution: 1 2 3 4 5 TOTAL:
16) Front hip circle
   form: 1 2 3
   execution: 1 2 3 4 5 6 TOTAL:

Side Horse

17) Front vault
   form: 1 2
18) Right leg full circle left
   form 1 2
   execution: 1 2 3 4 5 TOTAL:
19) Scissors (2-regular)
   form: 1 2
   execution: 1 2 3 4 5 6 TOTAL:

Trampoline

20) Back, front, seat, feet
   form: 1 2
   execution: 1 2 3 4 5 TOTAL:
21) All-fours drop, front somersault
   form: 1 2 3
   execution: 1 2 3 4 5 6 TOTAL:
22) Back to back
   form: 1 2 3
   execution: 1 2 3 4 5 6 TOTAL:

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