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AUTHOR Bischoff, Judith A.; Lewis, K. Ann
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ABSTRACT

This study measured the physical fitness, levels of creative thinking, and attitudes about physical education in second graders enrolled in physical education programs with different curricular focus: (1) aerobic fitness; (2) movement education; and (3) standard classroom teacher taught curriculum. Seventy-seven children and five teachers participated. The American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) Health-Related Fitness Test was given to all subjects in September and May of the school year; and "Torrance Figural Form A of Creative Thinking" was given in November and May. During February, March, and April, coding of student teacher interactions was done using a second generation modification of the "Nonverbal/Verbal Interaction Category System - Modified." Findings indicated that, in comparison with national norms, the children involved in physical education activities taught by physical education specialists made improvements in the fitness parameter, while children in programs taught by classroom teachers maintained or decreased in fitness levels. The average aerobic fitness lesson had a higher number of verbal interactions; however, movement education showed more of a balance of direct/indirect teacher verbal behaviors and a slightly higher percentage of student talk. Little difference was found across the groups in creative thinking. Appended tables provide information on statistical data gathered in the study. (JD)

Assessment of Fitness and Creative Thinking With An Environmental Description of Second Graders In Three Different Physical Education Curricula

by

Judith A. Bischoff
Assistant Professor

K. Ann Lewis
Associate Professor
Department of Physical Education
Northern Illinois University
DeKalb, Illinois 60115

815/753-1425 (office-Bischoff)
815/753-1400 (office-Lewis)

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Assessment of Fitness and Creative Thinking With An Environmental Description of Second Graders' In Three Different Physical Education Curricula

Through a cooperative arrangement between the DeKalb Illinois Community Unit District #428 and the Department of Physical Education at Northern Illinois University, an experiment in elementary physical education curriculum has been going on for nearly four years. This research is a small portion of that curriculum project and was conducted to determine what effects, if any, might be attributable to participation in different types of elementary physical education programs.

This study was designed to measure 1) physical fitness, 2) levels of creative thinking, and 3) childrens' attitudes about physical education in second graders enrolled in three elementary schools having a different physical education curricula focus, i.e., a) aerobic fitness, b) movement education, c) a standard school district classroom teacher taught curriculum (the control school). Additional data was collected on verbal and nonverbal interactions between students and teaching to describe the learning environment.

Program Description

The aerobic fitness program had four specific objectives, i.e., "improvement of a child's 1) health-related fitness, 2) motor skills, 3) physical self-image, and 4) attitude towards physical activity" (4, 7). Children in this program participate daily for 30 minutes in activities that are "primarily aerobic in nature and include vigorous fitness routines, motor skill related fitness tasks and strenuous

sport and game challenges. Particular emphasis is placed on the proper development and improvement of the arm and shoulder girdle muscles, abdominal muscles, leg muscles, musculoskeletal functioning of the lower back, flexibility, and cardiorespiratory efficiency" (10).

The movement education program in this study contains a thematic content organization, a range of teaching styles, and a humanistic teaching philosophy. The content of educational games, dance, and gymnastics was developed through the themes of space, effort, body, and relationship awareness. While achieving the highest level of skill attainable for each child was an objective, emphasis was also placed on understanding concepts, on observation and analysis of personal skill, and on creative use of skills in all three content areas. The climate of the learning environment was created by teacher behaviors which attempted to reach for the qualities of empathy, congruence and positive regard (3, 8, 11). Scheduling provided for a daily thirty minute period.

The elementary classroom physical education program that existed in the control school was planned and taught by the classroom teacher. Although the school system does not employ specialists in elementary physical education or supervision to monitor quality or consistency from building to building, it does provide its teachers with written materials in curriculum guide format. The overall content organization is subject matter oriented, i.e., 1) games with subclassifications including active, ball-type, and classroom; 2) rhythms and singing games; and 3) stunts and tumbling. While there are no statements concerning teaching methodology

or philosophy, there is a set of ten objectives for elementary physical education that span the three domains of growth-affective, cognitive, and psychomotor. During the period of time this study encompassed, the children averaged three thirty minute periods of activity weekly (6).

Method

The AAHPERD Health-Related Fitness Test (1) was administered to all three groups on a pretest/posttest basis. The test consisted of four items:

1. Sit-ups (number done in 60 seconds)

2. Sit and Reach (4 attempts, last attempt held and measured in centimeters)

3. Mile run (run time in minutes:seconds)

4. Body Composition (skinfold measures of the triceps - outside upper right arm and the subscapula-below right shoulder blade done with skinfold caliphers).

Height and weight were also measured at the same time.

The fitness test was administered to all subjects during regular physical educatic class periods in September and May. (The exception was the skinfold measures which were taken on a separate day and at a time arranged with the classroom teacher). One separate days but within two weeks of the above measurements, subscapular and triceps skinfolds were taken and the mile run was timed. All of the data were recorded on cards by graduate assistants, teachers and/or university faculty members.

The Torrance Figural Form A of Creative Thinking was given in November and May. A time was cleared with the classroom teachers and administered in their respective classrooms by one of the reseachers. The researcher

read the instructions to the children so their reading ability was not a limitation. The Torrance test (12) consisted of three parts: picture construction, picture completion, and lines. Each part has a ten minute time limit. The children were encouraged to use crayons and markers and to be as original and imaginative as possible. The scoring, done by Torrance trained evaluators, produces data about each child in the following five categories: Fluidity, Titles, Originality, Elaboration and Resistance to Closure.

The interaction analysis coding measured verbal/nonverbal student/teacher interactions and the gender of the student participant. The instrument consisted of two parts, teacher talk and student talk. Teacher talk was further divided into behaviors that are direct and indirect. Direct teaching is defined as that pattern of teaching behaviors which exerts more direct influence on the students in the learning environment resulting in a reduction of learner freedoms in decision making, i.e., "consists of stating the teachers' own opinions or ideas, directing the pupil's action, criticizing his/her behavior, or justifying the teacher's authority or use of that authority" (7:108). Indirect teaching is defined as that pattern of teaching behaviors that exerts more indirect influence which in turn maximizes opportunities for student decision making, i.e., "consists of soliciting the opinions or ideas of the pupils, applying or enlarging on those opinions or ideas, praising or encouraging the participation of pupils or clarifying and accepting their feelings" (7:108). Student talk categories cover various combinations of interactions, student to teacher and student to student.

During February, March and April, live coding of student/teacher interactions was done using Nonverbal/Verbal Interaction Category System-Modified (N-VICS-M) (9), a second generation modification of Verbal Interaction Category System (2). A graduate student was trained during the fall and reliability checks took place periodically within the four months. At the end of the training period, prior to the data collection, the graduate student coder and a second coder had a reliability check under the same conditions that would exist in the study. Reliability exceeded .80 in all categories of verbal behavior with the exception of the direct command and information category which was .58 and in the acceptance category, .73. The coding began as the teacher took roll and continued on an interval basis of "observe 5 seconds," "code 5 seconds." These intervals plus the scattered rest periods were synchronized between the two coders by use of an audio tape which gave instructions to the coders through head phones and were simultaneously preserved on audio tape along with the teacher's voice. Interactions were coded on an opscan computer sheet designed for the instrument. The audio equipment (tape recorders, head phones, amplifier, mixer) were arranged against the wall in a corner of the gymnasium. The teacher was equipped with a cordless remote control FM microphone to increase the possibility of hearing all interaction during the physical education period.

Interview questions addressing attitudes and feelings about participation in physical education were designed and pilot tested by the researchers and occurred on the days of the coding. The children were randomly selected by gender and an attempt was made to interview every

child in each physical education class. The children were asked:

1. How did you feel about your gym class today? Why?
2. How do you think your teacher felt about how you did in class today? How do you know how your teacher felt?
3. Do you like your gym class? Why?

The Torrance Figural Form A for Creative Thinking, the coding of student/teacher interaction and the interviewing of the children occurred in only two schools: 1) aerobic fitness and 2) movement education. The control school did not wish to participate in the above areas of data collection.

SUBJECTS

Seventy-seven second grade children and five teachers participated. There were 8 females and 17 males in aerobic fitness taught by one female teacher. In movement education, there were 13 females and 7 males taught at different times by two female and one male teacher. All four of these people were specialists in elementary physical education or senior student teachers with special preparation in elementary physical education. The control school group include 8 females and 14 males and had a female classroom teacher.

ANALYSIS

A two-way analysis of covariance (ANCOVA) and t-tests were used in the fitness and creative thinking data analysis: 1) ANCOVA, with pretest scores as the covariant was used to look for evidence of change attributable to school membership and/or gender and 2) t-test was used to locate the source

of the variation. The level of significance was set at .05. Further analysis of the fitness data included comparisons with national norms. Further analysis of the creative thinking data involved tallying the scores on the Checklists of Creative Strengths supplied by the trained Torrance scorers and using a t-test for between group comparisons.

Interobserver reliability of the M-VICS-M was determined using Scott's Coefficient of Reliability (5). Only the verbal portion of the instrument was found reliable (.76) to use in further analyzing the data. Tallies of the verbal behaviors (from the coded observations) were summed by category for all lessons, then averaged for one lesson, and converted to percentages. The qualitative interview data were similarly categorized, summed and converted to percentages.

RESULTS

FITNESS

ANCOVA's of the fitness data showed significance in two areas. First, the sit-up data yielded a main effect due to school membership ($F = 3,268$, $df = 2/51$) and an interaction between school and gender ($F = 4,777$, $df = 1/51$) (See Table 1).

INSERT TABLE 1 ABOUT HERE

The t-tests revealed that both females and males in the aerobic fitness program showed significant gains ($t = 3.02$, $df = 6$, and $t = 5.51$, $d = 14$, respectively) (see Table 2). Only the males in the movement education

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INSERT TABLE 2 ABOUT HERE

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program and females in the control program showed significant gains ($t = 3.21$, $df = 5$ and $t = 3.84$, $df = 8$ respectively) (see Table 2).

Second, in the mile run there was a significant main effect due to school membership ($F = 13,356$, $df = 2/47$) and gender ($F = 5.038$, $df = 1/47$) (see Table 1). The t-tests identified significance for both females ($t = 6.41$, $df = 6$) and males ($t = 6.19$, $df = 14$) in the aerobic fitness program.

The fitness data were also compared to the AAHPERD national norms (1). The males in the aerobic fitness program had moved above the 50th percentile on the post test in three fitness areas: sit-ups, sit and reach and the mile run (see Table 3). The scores for males in the

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insert Table 3 about here

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movement education program indicated a rise above the 50th percentile in sit-ups, sit and reach, and mile run while the males in the control group showed percentile improvement in the mile run and a slight decrease, although still above the 50th percentile, in the sit and reach.

Females in the control group and in the movement education program did show improvement but failed to reach the 50th percentile in any of the post fitness measures, while females in the aerobic fitness program reached the 50th percentile in three of the four fitness areas: sit-ups, sit and reach, and the mile run.

Creative Thinking

Analysis of the creative thinking data revealed significance in the Title Category, i.e., interactions between school and gender ($F = 4.901$,

df = 1/26) and a main effects of school membership (F = 6.334, df = 1/26) (see Table 4). There was also an interaction effect by school and gender for both fluidity (F = 4.45, df = 1/26) and originality (F = 6.561, df = 1/26).

INSERT TABLE 4 ABOUT HERE

An additional data source provided by the trained scorers is the Checklist of Creative Strengths which are areas where the children receive bonus points for their drawings (see Chart 1). The t-test was used on the Checklist

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INSERT CHART 1 ABOUT HERE

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of Creative Strengths and significance was found for the movement education curriculum in the post test of Category 3 "Movement and Action" (t = 2.47, df = 25).

Teaching Environment

Analysis of verbal behaviors yielded profiles of an "average" lesson in each program. In the aerobic fitness lessons, there were an average of 114 teacher/student interactions per lesson, 86% teacher talk (divided into 65% direct, 35% indirect) and 14% student talk. A movement education lesson averaged 87% teacher/student interactions per lesson, 83% teacher talk (59% direct, 41% indirect) and 17% student talk.

INSERT TABLES 5 & 6 ABOUT HERE

Qualitative analysis of the interview data from both female and male students indicated positive feelings about the activities in their physical education curriculum regardless of the program in which they participated.

DISCUSSION

Second graders in the three curricula studies appeared to be more alike than different. One exception was found in the fitness area where the children in the aerobic fitness curriculum excelled in the measures of sit-ups and mile run performance. In comparison with the national norms, the research appears to indicate that the children involved in physical education activities taught by physical education specialists make improvements in the fitness parameter, whereas, children in a program delivered by a classroom teacher maintain or decrease in fitness levels. The effect of the latter group having activity only three days a week may contribute to this condition.

Another difference occurred in each lesson's verbal behavior. The average aerobic fitness lesson had a higher number of verbal interactions from all tegories, however the movement education lesson showed more of a balance of direct/indirect teacher verbal behaviors and a slightly higher percentage of student talk.

The Torrance Creative Thinking data between the aerobic fitness and movement education curricula showed little differences in the five category areas. In utilizing the data from the Checklist of Creative Strengths, the second grade children in the movement education curriculum indicated a significant strength in the area of "Movement and Action." Some of the terminology associated with this area are: running, dancing, flying, falling.

In summary, it may be said that the children in the aerobic fitness program would benefit from more creative opportunities in their curriculum,

while the children in the movement education program need to have more of their activities directed to increasing their fitness levels. Future research needs to focus on all grade levels, and be done extensively enough so that larger numbers of children can be studied, and be combined with an analysis of program objectives.

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TABLE 1

ANCOVA RESULTS ON FITNESS MEASURES
BY SCHOOL AND BY GENDER

FITNESS ITEMS	GROUP MEMBERSHIPS					
	By School		By Gender		Interaction	
	F ratio	p	F ratio	p	F ratio	p
BODY COMPOSITION	3.151	0.051	2.941	0.092	2.246	0.115
SIT-UPS	3.268	0.047*	0.092	0.763	4.777	0.013*
SIT AND REACH	2.102	0.134	0.403	0.529	0.622	0.541
MILE RUN	13.356	0.000*	5.083	0.030*	1.696	0.196

*$p<.05$

TABLE 2

T-TEST COMPARISONS OF FITNESS ASSESSMENTS OF

SECOND GRADERS BY CURRICULA AND GENDER

CURRICULA	BODY COMPOSITION		SIT-UPS		SIT & REACH		MILE RUN	
	t	p	t	p	t	p	t	p
CONTROL SCHOOL								
FEMALES	3.39*[a]	0.005	-3.84*	0.005	2.36*[a]	0.046	-0.31	0.761
	N = 14		N = 9		N = 9		N = 9	
MALES	4.61*[a]	.001	-1.21	0.314	0.19	0.861	3.01	0.057
	N = 10		N = 4		N = 4		N = 4	
AEROBIC FITNESS								
FEMALES	2.58*[a]	0.042	3.02*	0.023	1.24	0.262	6.41*	0.001
	N = 7		N = 7		N = 7		N = 7	
MALES	4.89*[a]	0.000	5.51*	0.000	0.48	0.636	6.19*	0.000
	N = 15		N = 15		N = 15		N = 14	
MOVEMENT EDUCATION								
FEMALES	0.91	0.387	-1.24	0.244	-0.62	0.551	-2.06	0.073
	N = 10		N = 11		N = 12		N = 9	
MALES	2.32	.068	-3.21*	0.024	-0.81	0.456	-1.07	0.345
	N = 6		N = 6		N = 6		N = 5	

* $p < .05$

[a] significance not found in ANCOVA

TABLE 3

COMPARISON OF SECOND GRADERS' PRE/POST FITNESS SCORES WITH NATIONAL NORMS

CURRICULA	SKINFOLD (Sum of subscapular & triceps)			SITUPS			SIT/REACH			MILE RUN		
	$\bar{x}$	SD	%ile	$\bar{x}$	SD	%ile	$\bar{x}$	SD	%ile	$\bar{x}$	SD	%ile
CONTROL FEMALES		N=14			N=9			N=9			N=9	
PRE	24.96	±11.10	10-15	**23	± 7.05	10-15	28.89	±3.76	55	12.27	±1.33	50-55
POST	22.25	±10.27	15	28	± 9.24	35	25.78	±5.14	30	12.55	±2.48	45
MALES		N=10			N=4			N=4			N=4	
PRE	18.20	± 2.23	10	8	±10.71	20-25	30.00	±2.94	85	13.21	±1.04	30-35
POST	16.35	± 2.86	20	21	± 8.35	30	29.79	±2.99	80	10.92	±1.03	55-60
AEROBIC FITNESS FEMALES		N=7			N=7			N=7			N=7	
PRE	20.43	± 1.51	20	*27	± 9.81	50-55	29.14	±3.89	60-65	**12.57	±1.05	45
POST	16.50	± 3.64	40	38	± 3.65	85	30.71	±4.50	70	10.08	±1.07	80-85
MALES		N=15			N=15			N=15			N=14	
PRE	19.87	± 4.48	5-10	***27	± 9.24	50-55	26.80	±5.28	60	***10.53	±1.82	55-60
POST	15.37	± 4.81	25	33	±11.11	75	27.40	±7.88	65-70	9.02	±1.35	80-85
MOVEMENT EDUCATION FEMALES		N=10			N=11			N=12			N=9	
PRE	23.30	± 9.69	10-15	23	± 7.86	30	25.42	±6.36	30	12.57	±1.82	45
POST	22.90	± 8.78	10-15	25	± 8.78	40	26.17	±8.38	35-40	14.61	±3.00	20-25
MALES		N=6			N=6			N=6			N=5	
PRE	20.50	± 3.80	5-10	*26	± 9.19	50	24.67	±1.37	40-45	11.60	±1.67	40-45
POST	16.50	± 4.15	20	34	± 8.81	80	25.67	±4.08	50-55	11.09	±2.29	55

*** $p < .001$
** $p < .01$
* $p < .05$

TABLE 4

ANCOVA RESULTS ON TORRANCE
CREATIVE ITEMS
BY SCHOOL AND BY GENDER

CREATIVE THINKING	GROUP MEMBERSHIPS					
	By School		By Gender		Interaction	
	F ratio	p	F ratio	p	F ratio	p
FLUIDITY	1.721	0.203	4.238	0.052	4.455	0.046*
TITLES	6.334	0.020*	0.458	0.506	4.901	0.038*
ORIGINALITY	1.933	0.178	1.989	0.172	6.561	0.018*
ELABORATION	0.058	0.812	0.285	0.599	0.054	0.818
RESISTANCE TO CLOSURE	2.750	0.111	0.003	0.956	0.106	0.747

*p<.05

Chart 1. Checklist of Creative Strengths

Checklist of Creative Strengths:

____ 1. Expression of feeling or emotion in drawings and titles

____ 2. Articulateness in telling story; context, environment

____ 3. Movement and action (running, dancing, flying, falling, etc.)

____ 4. Expressiveness of titles

____ 5. Combination of two or more incomplete figures (Act. 2)

____ 6. Combination of two or more sets of lines (Act. 3)

____ 7. Unusual visual perspective (below, above, at an angle, etc.)

____ 8. Internal visual perspective (inside, cross section)

____ 9. Extending/breaking boundaries/penetrating lines (rectangle)

____ 10. Humor in titles/captions/drawings, etc.

____ 11. Richness of imagery (variety, vividness, strength, etc.)

____ 12. Colorfulness of imagery (excitingness, earthiness, etc.)

____ 13. Fantasy (figures in myths, fables, fairy tales, science fiction)

TABLE 5

TYPE AND QUANTITY OF TEACHER VERBAL BEHAVIORS BY PROGRAM

Categories	Aerobic Fitness		Movement Education	
	Average tallies per lesson	% of total teacher talk	Average tallies per lesson	% of total teacher talk
TEACHER TALK				
Direct				
Initiated				
Instructions and Information	49.82	50.60	34.11	46.94
Request to see movement	6.82	6.93	4.22	5.81
Total Response	56.64	57.53	38.33	52.75
Negative affect	7.73	7.85	4.22	5.81
Total Direct	64.37	65.38	42.55	58.56
Indirect				
Initiated				
Narrow Questions	10.00	10.16	11.89	16.36
Broad Questions	1.55	1.57	3.56	4.90
Problem Solvers	2.45	2.49	2.33	3.21
Total Response	14.00	14.22	17.78	24.47
Positive affect	20.09	20.40	12.33	16.97
Total Indirect	34.09	34.62	30.11	41.44

TABLE 6

TYPE AND QUANITITY OF TEACHER/STUDENT VERBAL INTERACTION BY PROGRAM

	Average tallies per lesson	% of total talk	Average tallies per lesson	% of total talk
TEACHER TALK	98.46	86.23	72.67	83.42
STUDENT TALK	15.73	13.77	14.44	16.58
Grand Total	114.18	100.00	87.11	100.00