Age, Weight and Vital Capacity as Determining Factors in Homogeneous Grouping of Non-Swimmers

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by

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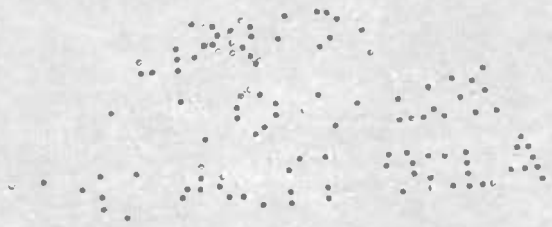

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Preface

The purpose of this study is an attempt to find a method for grouping non-swimmers for instruction by finding the correlation of age, weight and vital capacity with swimming ability after one semester of instruction. Data to be obtained from the records in the Women's Physical Education Department.

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Introduction

It is the tendency of educators today to group students for instruction according to ability[1]. This study is an attempt to find a method for grouping non-swimmers according to their ability to learn swimming.

Age, weight, vital capacity, bouyancy, fear of water, coordination, and rhythm are acknowledged determining factors in learning to swim[2]. This study will deal only with age, weight and vital capacity as other acknowledged determining factors can only be tested after the student has actually participated in the activity.

It is hoped that this study will be helpful in making the homogeneous grouping before the student is enrolled for classwork.

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[1]Worlton, I. T., Effect of homogeneous classification on the scholastic achievement of bright pupils. El School J 28:336-45 Ja '28

[2]Sheffield, Lyba and Nita, Swimming simplified

Homogeneous Grouping

In the past educators have recognized tests as an administrative device to help effect a classification of pupils in the grades into superior, average, and below-average groups so that each of these would be relatively more homogeneous in ability.

> The advantages of such an arrangement are fairly obvious. The more capable pupils are given work adapted to their level of intelligence. Those of less ability may have work graded to their particular needs, and special studies of their disabilities may be. Intelligence tests have been used extensively as a basis of such classification [3].

Grade teachers have noticed the advantages of grouping.

> Horizontal classification, or grouping according to equal ability within the grade, is a plan that has been rather widely adopted, particularly by the larger schools where such a plan is feasible[4].

Physical Education has done little toward grouping according to ability[5]. The programming of physical education is too often a matter of fitting around an already scheduled academic plan. However, we find a few feasible plans actually worked out in a very satisfactory manner. One of these is the Four Point Classification scheme recommended by the California State Department.

> This Four Point Classification Plan takes into account four varying factors,----grade, age, height, and weight. The method used in the plan is to establish

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[3] Benson-Lough-Skinner-West, Psychology for teachers, p 283
[4] Ralston and Gage, Present day psychology, p. 279
[5] Palmer, Irene, Tests and measurements, . 21

> an exponent or coordinating number for the grade, age, height and weight, and then by adding these four exponents, a total is found which places each pupil in his own class[6].

Another test of popular interest is the Foster's Test of Physical Efficiency[7]. This test is used to classify as to proper and improper physical conditions. The object of this test was to determine the action of the heart after a mild form of exercise.

Tests of Physical Capacity introduced by Dr. Dudley A. Sargent is very good for rating and classifying.

> By this test Dr. Sargent sought to measure the strength, speed, energy, and skill of the neuro-muscular mechanism as applied to the overcoming of the force of gravity[8].

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[6]Ibid., p. 51
[7]Ibid., p. 62
[8]Ibid., p. 68

Procedure

This study was conducted on 246 non-swimmers at Oklahoma Agricultural and Mechanical College for the school years, from 1932 to 1934 inclusive.

The data used were obtained from the records on file in the Women's Physical Education Department. Age and weight were taken before swimming instruction. The vital capacity of Group No. I was taken before the swimming instruction was given. The vital capacity of Group No. II was taken at the close of the instruction period of one semester, or eighteen weeks. In this study the two groups were combined and used as one. Swimming ability grades only was used; written tests and attendance included for final swimming grades was disregarded.

Age is recorded in years, weight in pounds and tenths of pounds, and vital capacity in cubic inches. The grades are based on 100 per cent.

The instrument used to measure the vital capacity was the Wet Spirometer, Narragansett Machine Company, Providence, Rhode Island. The instrument used to determine the weight was scales from the Buffalo Scales Company, Buffalo, New York.

The Product-Moment method, as given by Palmer, was used in determining the correlation[9]. The Probable Error

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[9] Palmer, Irene, Tests and measurements p. 34-39

formula was taken from Garrett[10]. These formulas are given on the following page.

[10]Garrett, Statistics in psychology and education p 125

$$r = \frac{\frac{\Sigma x'y'}{N} - c_x c_y}{\sigma_x \sigma_y}$$

$$P.E._r = \frac{.6745(1-r^2)}{\sqrt{N}}$$

Formulas used in finding Correlations and Probable Errors

Group No. I.

Case Number	Age	Weight	Vital Capacity	Grade
1	19	103	135	60
2	17	101.2	150	94
3	17	137.5	220	87
4	17	121.5	134	82
5	17	108	150	80
6	19	121.5	180	88
7	19	94.5	180	72
8	24	144.2	230	87
9	17	95.5	133	78
10	18	106.5	178	86
11	18	93.2	160	88
12	22	147	143	83
13	17	152.2	179	80
14	17	108	180	85
15	19	106.5	160	82
16	18	113.7	140	60
17	20	140	170	90
18	20	114	160	93
19	19	105.5	170	89
20	18	135	175	87
21	19	123	230	80
22	20	93.5	162	85
23	18	119	180	88

Case Number	Age	Weight	Vital Capacity	Grade
24	20	111	190	86
25	18	125.5	130	80
26	18	109.5	180	80
27	16	126.1	130	75
28	18	108.5	164	70
29	18	128	180	86
30	18	117	150	90
31	17	100	135	93
32	18	112	210	88
33	20	113	180	93
34	18	113	180	82
35	17	121	150	89
36	18	134	210	93
37	18	118.5	180	93
38	19	125.2	180	70
39	18	112	200	93
40	18	100	170	80
41	16	115	180	88
42	17	119.5	100	80
43	18	125	163	82
44	18	104	230	80
45	19	87.5	110	84
46	21	145	185	93
47	18	116.5	200	90
48	18	115.5	185	80

Case Number	Age	Weight	Vital Capacity	Grade
49	17	123	152	90
50	19	92.3	103	82
51	20	130	150	65
52	20	112	130	60
53	18	103	152	89
54	18	130	152	93
55	18	120	151	84
56	19	111	188	80
57	19	118	180	93
58	19	87.5	117	85
59	19	106	162	85
60	17	131.3	180	88
61	17	106	190	94
62	20	109.5	178	78
63	18	118	175	85
64	18	108	150	80
65	19	118	170	80
66	17	136	223	83
67	20	121	180	83
68	19	144	150	73
69	18	108	160	87
70	20	126	166	90
71	21	139.5	197	60
72	18	130	170	88
73	18	138	209	93

Case Number	Age	Weight	Vital Capacity	Grade
74	18	119	152	70
75	17	135	172	80
76	17	108	150	92
77	21	115	200	83
78	18	90.5	139	88
79	18	121	156	90
80	18	108	180	88
81	18	110	160	90
82	18	115	190	93
83	17	116	190	95
84	17	111	155	80
85	19	104	150	80
86	17	107	140	84
87	16	114	170	83
88	17	121	165	83
89	18	108	160	90
90	18	118	190	88
91	18	109.7	180	65
92	18	170	170	85
93	17	158.5	110	78
94	18	119.5	160	80
95	19	115.5	180	86
96	19	125	146	82
97	17	124.5	235	85
98	17	106	170	82

Case Number	Age	Weight	Vital Capacity	Grade
99	22	176	218	84
100	18	122	170	78
101	18	124.7	210	80
102	19	110	133	80
103	20	156	187	88
104	19	142	210	83
105	16	101.7	163	72
106	18	118	140	88
107	17	105	130	80
108	18	104.5	190	80
109	17	114.5	170	78
110	21	140.5	155	70
111	17	115.7	185	84
112	19	118	190	85
113	18	106	130	65
114	17	132.5	160	80
115	18	127.2	168	83
116	18	106	140	75
117	19	127.2	240	90
118	18	129	210	87
119	17	108	150	89
120	20	86	135	84
121	32	126	170	85
122	18	120	160	86

Case Number	Age	Weight	Vital Capacity	Grade
123	18	106	150	93
124	18	120	170	90
125	18	123	209	93
126	20	108	190	93
127	16	121	190	84
128	19	94	108	85
129	19	105	158	83
130	19	103.5	170	70
131	19	91	130	70
132	20	125	190	88
133	17	132	225	78
134	18	94.5	170	77
135	18	113.5	164	80
136	19	120	150	87
137	18	106.5	105	88
138	18	160	162	84
139	20	135	170	77
140	18	108	170	86
141	18	101	160	87
142	18	149	200	88
143	20	113	210	90
144	19	92	144	84
145	18	126.5	190	78
146	14	100.5	186	75

Case Number	Age	Weight	Vital Capacity	Grade
147	22	176.3	230	80
148	27	116	180	75
149	20	117.5	190	88
150	22	109.6	150	83
151	24	110.5	156	80
152	17	100.5	156	83
153	17	102.5	186	85
154	21	99	190	78
155	28	110	194	81
156	27	127.7	160	83
157	23	113.2	170	90
158	21	113	158	80
159	18	133	180	87
160	18	96.5	160	90
161	21	101	162	82
162	17	122.5	152	81
163	20	135	190	80
164	25	120.5	170	78
165	18	135	230	84
166	25	125	250	90
167	26	152	234	88
168	18	116.5	104	60
169	17	89.5	174	87
170	25	117.5	210	80

Case Number	Age	Weight	Vital Capacity	Grade
171	22	128.5	220	83
172	23	113	195	85
173	25	118	172	88
174	27	126.5	214	70
175	21	118	168	78
176	24	113.5	210	90

Group No. II

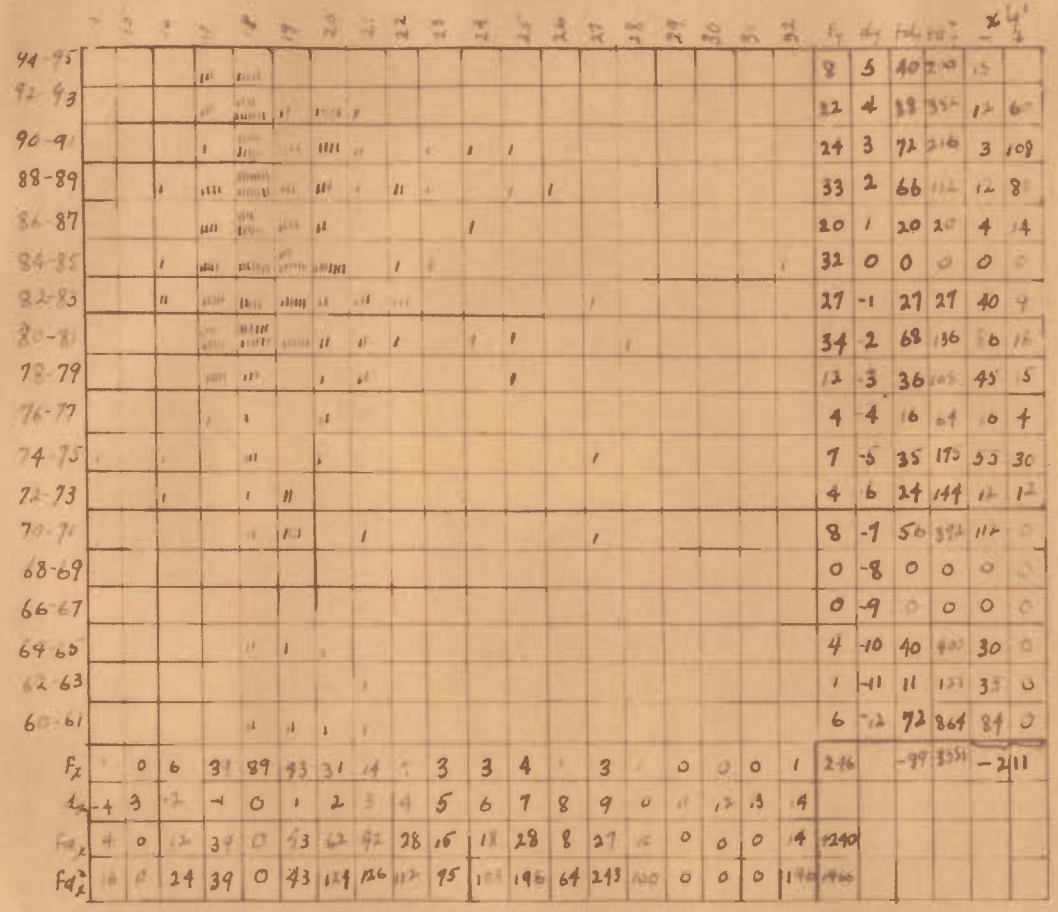
Case Number	Age	Weight	Vital Capacity	Grade
177	17	129	180	93
178	19	123	200	80
179	21	106	150	81
180	19	134.5	210	60
181	20	122	195	90
182	19	140	200	90
183	18	126	174	94
184	18	138	195	94
185	18	124	170	90
186	20	118	158	93
187	18	138	180	89
188	19	122.5	188	87
189	18	138	195	93
190	20	113	160	85
191	17	164	175	86
192	18	162	190	90
193	18	103.5	180	90
194	20	124.5	180	87
195	18	105.5	212	95
196	18	121.7	182	80
197	20	121.5	180	80
198	20	120	180	85
199	19	124.5	160	93

Case Number	Age	Weight	Vital Capacity	Grade
200	18	122	170	89
201	18	124	170	94
202	18	108	170	88
203	18	111.5	170	85
204	19	111	190	84
205	19	113	220	90
206	20	107	100	84
207	19	132	185	87
208	18	134	189	78
209	20	127	199	75
210	22	142	143	89
211	18	132	188	89
212	20	118	180	76
213	23	121	230	89
214	17	133.5	160	78
215	18	111	170	88
216	18	108	148	75
217	18	111.2	170	75
218	19	125.5	208	84
219	18	105	165	95
220	18	123	198	82
221	17	108	180	76
222	19	144	200	85
223	20	159	210	85
224	21	181.5	180	88

Case Number	Age	Weight	Vital Capacity	Grade
225	19	137.5	168	83
226	18	115.5	194	84
227	19	123	225	88
228	20	138	195	93
229	19	114.5	172	90
230	21	132.5	185	90
231	20	120.5	210	85
232	20	116.7	150	82
233	22	156	211	88
234	19	114.7	170	65
235	18	111	220	93
236	17	126	151	89
237	18	117	188	93
238	18	121.5	180	70
239	21	138.7	190	62
240	21	112	210	90
241	18	122.5	202	83
242	18	112	200	80
243	18	121	160	72
244	21	109	170	82
245	17	113	152	87
246	16	121	192	82

Age x-variable

Grade y variable



$C_y = \frac{-99}{246} = -.4024$

$C_y^2 = .1619$

$C_y = .1619 \times 2 = .3238$

$\sigma_y = \sqrt{\frac{3351}{246} - .1619} \times 2 =$

$3.6687 \times 2 = 7.3374$

$C_x = +\frac{240}{246} = .9755$

$C_x^2 = .9516$

$C_x = .9516 \times 1 = .9516$

$\sigma_x = \sqrt{\frac{1466}{246} - .9516} \times 1 =$

$2.2061 \times 1 = 2.2061$

$$r = \frac{\frac{-211}{246} - (-.4024 \times +.9755)}{3.6687 \times 2.2061} =$$

$$\frac{-.8575 + .3924}{8.0935} = -.05$$

$$P.E. = \frac{.6745(1-.99)}{\sqrt{246}} =$$

$$\frac{.6677}{15.6} = .04$$

Table I. Computation of Coefficient of Correlation and Probable Error of Age and Grade of 246 Non-Swimmers at Oklahoma Agricultural and Mechanical College, from 1932 to 1934 inclusive.

Weight x - variable

Grade y - variable

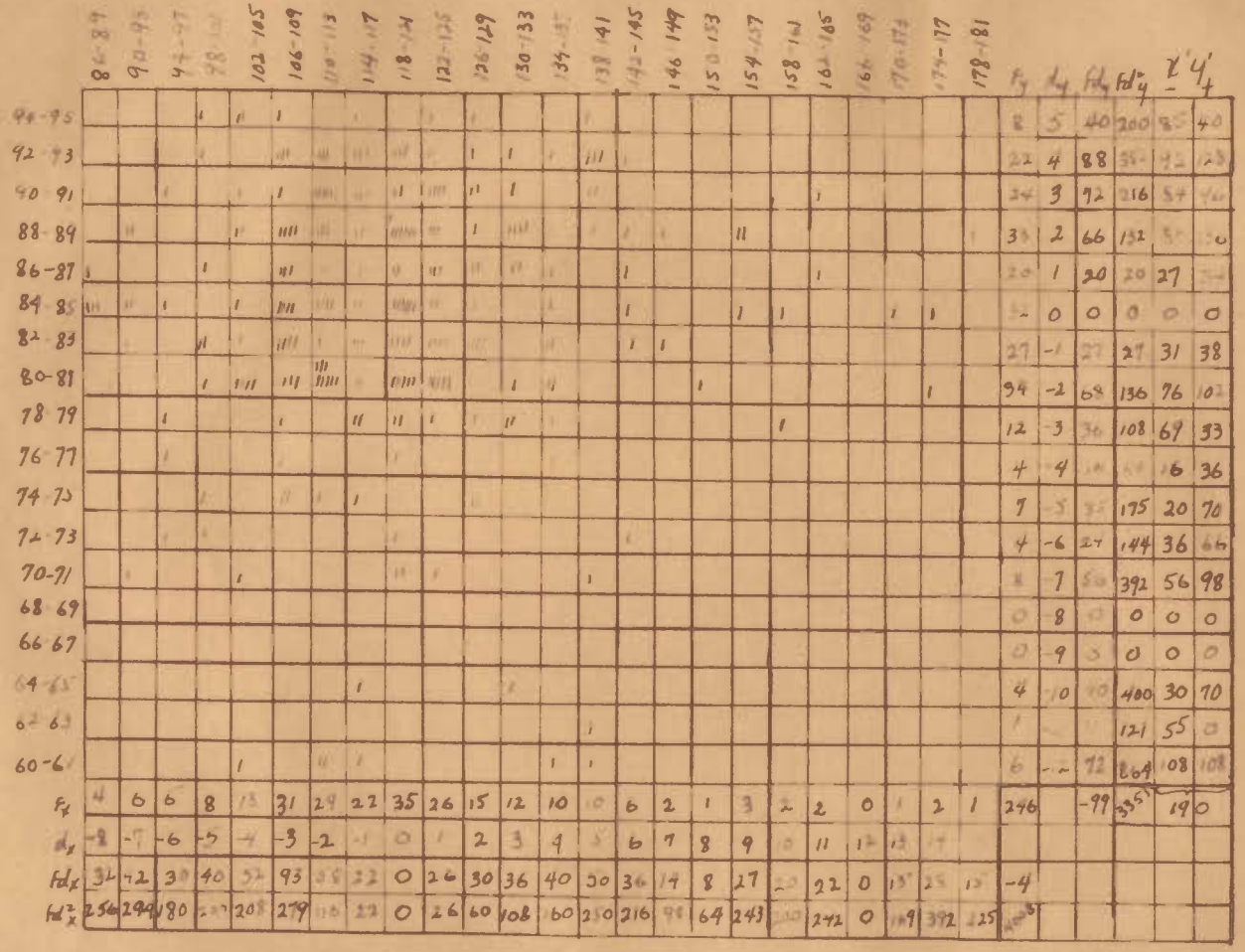


Table II. Computation of Coefficient of Correlation and Probable Error of Weight and Grade of 246 Non-Swimmers at Oklahoma Agricultural and Mechanical College, from 1932 to 1934 inclusive.

$$c_y = \frac{-99}{246} = -.4024$$

$$c'_y = .1619$$

$$C_y = .1619 \times 2 = .3238$$

$$\sigma_y = \sqrt{\frac{3255}{246} - .1619} \times 2 =$$

$$3.6687 \times 2 = 7.3374$$

$$c_x = \frac{-7}{246} = -.0162$$

$$c'_x = .6002$$

$$C_x = .0002 \times 4 = .0008$$

$$\sigma_x = \sqrt{\frac{4008}{246} - .0002} \times 4$$

$$4.0363 \times 4 = 16.1452$$

$$r = \frac{\frac{140}{246} - (-.4024 \times -.0162)}{3.6687 \times 4.0363}$$

$$r = \frac{.7788}{14.80} = .052$$

$$P.E. = \frac{.6745 \times (1 - .0027)}{15.6} =$$

$$\frac{.6724}{15.6} = .04$$

Vital Capacity x – variable

Grade y-variable

y \ x	98-103	104-109	110-115	116-121	122-127	128-133	134-139	140-145	146-151	152-157	158-163	164-169	170-175	176-181	182-187	188-193	194-199	200-205	206-211	212-217	218-223	224-229	230-235	236-241	242-247	248-253	f_y	d_y	fd_y	fd_y^2	$\sum x'y'$	f_t
94-95									I			I	II			II	I										8	5	40	200	25	85
92-93							I		II	I	III			III	I	III	II	I	III		I						22	4	88	352	92	216
90-91									I	II	III	I	IIII	I	I	I	I	II	III		I			I		I	24	3	72	216	57	210
88-89		I					I	II	III	I	I		IIIII	IIII	I	IIII		I	II			I	II				33	2	66	132	88	154
86-87									I	I	III		IIII	IIII	I	III			I		I		I				20	1	20	20	13	37
84-85	I	I	I	I			I	II	I		IIII		IIII	II	II	III	II	I	II		I		II				32	0	0	0	0	0
82-83	I						I	I	III	I	IIII	II	III	II		I	I	II	I		II						27	-1	27	27	41	51
80-81	I					III			IIII	III	III	I	III	III	II	III	I	II	II				III				34	-2	68	136	149	130
78-79			I			I					I	I	III	I		III						I					12	-3	36	108	57	60
76-77													II	II													4	-4	16	64	8	0
74-75						I		I	I				I	I	I		I										7	-5	35	175	35	80
72-73									I		II			I													4	-6	24	144	6	48
70-71						I				II		I	I	II						I							8	-7	56	392	63	98
68-69																											0	-8	0	0	0	0
66-67																											0	-9	0	0	0	0
64-65						I			I				I	I													4	-10	40	400	10	110
62-63																I											1	-11	11	121	33	0
60-61		I				I	I	I									I		I								6	-12	72	864	120	348
f_x	3	3	2	1	0	8	5	7	19	11	25	8	35	32	9	23	10	9	15	2	6	2	8	1	0	1	246		-99	3351	821	
d_x	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13						
fd_x	36	33	20	9	0	56	30	35	76	33	50	8	0	32	18	69	40	45	90	14	48	18	80	11	0	13	-192					
fd_x^2	432	363	200	81	0	392	180	175	304	99	100	8	0	32	36	207	160	225	540	98	288	162	800	121	0	169						

Table III Computation of Coefficient of Correlation and Probable Error of Vital Capacity and Grade of 246 Non-Swimmers at Oklahoma Agricultural and Mechanical College, from 1932 to 1934 inclusive.

$C_y = \frac{-99}{246} = -.4024$

$c^2_y = .1619$

$C_y = .1619 \times 2 = .3238$

$\sigma_y = \sqrt{\frac{3351}{246} - .1619} \times 2 =$

$3.6687 \times 2 = 7.3374$

$C_x = \frac{192}{246} = .3739$

$c^2_x = .1398$

$C_x = .1398 \times 6 = .8388$

$\sigma_x = \sqrt{\frac{5268}{246} - .1398} \times 6 =$

$4.6124 \times 6 = 27.6744$

$r = \frac{\frac{821}{246} - (.3739 \times -.4024)}{4.6124 \times 3.6687} =$

$\frac{3.4877}{16.9215} = .21$ (nearly)

$P.E. = \frac{.6745(1 - .44)}{\sqrt{246}} =$

$\frac{.3777}{15.6} = .02$

Conclusions

The result of the correlation of the swimming rating and age of 246 non-swimmers at Oklahoma Agricultural and Mechanical College, from 1932 to 1934 inclusive, tends to show that ages between fourteen and thirty-two cannot be used as a prediction of ability to learn to swim. The final correlation was so small, -.05, and the probable error was so high that we consider the correlation as not significant[11].

Vital Capacity had a low correlation, .21 with a probable error of .02, but it is large enough to be of slight significance as a determining factor[12].

Weight had the low correlation of .05. The probable error, .02, cannot be contained four times within the correlation, therefore we consider this correlation as not being significant[13].

The results of this study tends to show that age, weight and vital capacity have little significance as determining factors for homogeneous grouping of non-swimmers.

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[11] Garrett, loc. cit.
[12] Ibid.
[13] Ibid.

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