

AN INVESTIGATION INTO THE DISCRIMINATORY POWER OF THE
STRONG VOCATIONAL INTEREST BLANK FOR 80
BOZEMAN HIGH SCHOOL SENIOR BOYS

BY
WILLIAM HAMMER

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CHAPTER I

INTRODUCTION

The cultural importance of interest measurement has been recognized only during the past two or three decades. Materialistic societies have so long regarded abilities as the criterion of life's successes that they have neglected the philosophy of happiness. Before interest measurement can be viewed in its true prospective, one must start with a basic assumption contrary to that nurtured by modern commercialism wherein successful accomplishment is the criterion of measurement. Happy accomplishment must be the cornerstone of any modern individualistic philosophy. Interest measurement is concerned with a distribution of interest which this philosophy assumes as the basis of happiness. The significance of interest measurement lies not in its relation to social efficiency, but rather in its measurement of a cultural development which is related to social happiness.¹

If interests then are to be considered a factor of such central importance in the realization of man's dreams and subsequent fulfillment, what has man done in the development of instruments which adequately measure his interests?

¹Fryer, D., Measurement of Interests, Henry Holt and Company, New York, N. Y., 1931, pp. 3-59.

Bordin, in his review of the Strong Vocational Interest Blank (SVIB), revised edition 1951, stated, "Despite the fact that it is one of the most time-consuming and costly inventories to score . . . (it) remains as the interest test whose usefulness has been most carefully and thoroughly demonstrated."²

The writer has long been concerned about the assumption that the SVIB is a valuable counseling instrument as succinctly stated by Hinckley, "the SVIB is a valuable instrument in the vocational counseling situation as an adjunct to other sources of information about the individual."³ This concern about the ability of the SVIB to discriminate among the interest patterns of youngsters prompted this investigation.

Statement of the Problem

Does the SVIB discriminate among the interests of a select group of high school students? A Statistical comparison between the means of the national criteria group and 80 Bozeman High School senior boys formed the bases of comparison. In this study, the null hypothesis was taken to be that no significant difference existed between the

²Bordin, Edward S., The Fourth Mental Measurements Yearbook, edited by Buros, O. K., The Gryphon Press, New Jersey, 1953, p. 747.

³Hinckley, Elmer K., Ibid. P. 747.

means of the criterion group and the means of the select group at the .01 (1%) level of confidence.

Procedures

The SVIB for men was administered during the fall of 1961 to eighty senior boys of the Bozeman High School, Bozeman, Montana. The instrument was administered as a part of the over-all guidance program conducted by the school. Scoring of the inventory was accomplished by the usual machine methods. Fifteen occupations or areas were scored. These fifteen occupations were treated statistically to derive means and standard deviations in terms of raw score units. Upon the completion of this initial step, the null hypothesis was tested. The national norms, which included the means and standard deviations for the SVIB, were obtained from the author of the instrument.⁴

Definition of Terms

For the purpose of this investigation, "interest" is defined as a term employed in two senses, functional and structural: (1) designating a type of feeling experience, which might be called 'worth-whileness', associated

⁴Strong, E. K. Jr., Scoring Cards for the SVIB, Stanford University Press, Stanford University, Calif., 1945.

with attention to an object, or course of action; (2) an element or item in an individual's make-up, either congenital or acquired, because of which he tends to have this feeling of 'worth-whileness' in connection with certain objects, or matters relating to a particular subject, or a particular field of knowledge, as, for example, psychology. What has been called the "doctrine of interest" in education is the theory that education must be based on the interest of the child, always starting from its existing interests, and seeking to develop new interests on the foundation of these.⁵

Limitations

An investigation limited to a small sample from one locality at one time would be, and perhaps justifiably so, of itself a definite limitation. The writer does not profess concern or question the reliability and validity of the SVIB when dealing with large numbers of subjects. Research disclosed innumerable studies attesting to its' reliability and validity. The smallness of the sample is inescapable in the situation under investigation; therein lies the value to be derived from this investigation.

In order that the reader may gain a better under-

⁵Drever, James, A Dictionary of Psychology, Penguin Books, Baltimore, Maryland, 1961, p. 140.

standing of this investigation, a brief explanation of the nature of the Strong Vocational Interest Blank is given in Chapter II.

CHAPTER II
THE NATURE OF THE STRONG VOCATIONAL
INTEREST BLANK FOR MEN

The position of pre-eminence of the Strong Vocational Interest Blank within the field of interest measurement has never been seriously challenged. The original form of the Men's Vocational Interest Blank (A) with 420 items, was published in May, 1927. A special form (B) for students appeared in November, 1934. The present revised form (M), with 400 items, was issued in October, 1938.

According to Strong, "men engaged in occupations so far studied have a characteristic pattern of likes and dislikes that differentiates them from men in other occupations."¹ Strong further claimed, "age does not affect interests to any great degree, for the interests of 15-year old boys, young men, and older men of 55-years are all remarkably alike. The correlation between the likes of 15 and 25-year old men is .82 and that between 25 and 55-year olds is .88."² These were indeed strong claims for the instrument, and if true make the SVIB of incalculable value for use in vocational counseling.

The test was devised to aid young men in making their occupational choices. It is a measure of one's interests

¹Strong, E. K. Jr., Vocational Interests of Men and Women, Stanford University Press, Stanford University, Calif. 1943, p. 107.

²Ibid, p. 91

interpreted in terms of occupations. It is not a measure of specific or general abilities, including intelligence. These abilities should be determined by other means and considered together with interest ratings in determining a person's vocational choice.

The test has been standardized in terms of the interests of men known to be successful in their occupations. It is assumed that, if a man likes to do the things which men like who are successful in a given occupation and dislikes to do the things which the same men dislike to do, he will feel at home in that occupational environment. Seemingly, also, he should be more effective there than somewhere else because he would be engaged, in the main, in work he liked.³

A brief characterization is given here for each of the 15 occupational criteria groups, together with the number upon which norms are based. Except when expressly stated otherwise, all of the men reported on have been engaged in their occupations for at least the 3 previous years; none are over 60 years of age.

(1) ARCHITECT. (N=241, X=124.3, o=49.54).
Members of the California State Board of Architecture.
Average age = 42.8; education = 14.4 grade.

³Strong, E. K. Jr., Manual for Vocational Interest Blank for Men, Stanford University Press, Stanford University California, January, 1945, p. 1.

(2) PHYSICIAN. ($N=337$, $\bar{X}=76.34$, $\sigma=41.39$). Graduates of Yale and Stanford Medical Schools. Includes 262 physicians and 75 surgeons (no difference of interests between them). 253 are from California, 47 from Connecticut, and 9 from New York; the remaining are scattered. Average age = 40.9 years; education = 18.5 grade.

(3) ENGINEER. ($N=513$, $\bar{X}=109.3$, $\sigma=42.40$). Includes 92 mining engineers, 126 mechanical engineers, 147 civil engineers, and 148 electrical engineers. Three-fourths are full members and one-fourth are associate members of the four engineering societies. Average age = 43.9; education = 15.4 grade.

(4) CHEMIST. ($N=297$, $\bar{X}=101.8$, $\sigma=41.93$). Members of the American Chemical Society; college professors not included. Average age = 35.2; education = 16.8 grade.

(5) PRODUCTION MANAGER. ($N=216$, $\bar{X}=59.5$, $\sigma=30.52$). Includes 114 blanks obtained through the Psychological Corporation, 28 blanks returned from mailings made to production managers as listed in Thomas' Register of American Manufacturers, and 76 from miscellaneous sources. Average age = 42.8; education = 13.3 grade.

(6) CARPENTER. ($N=181$, $\bar{X}=99.2$, $\sigma=44.99$). Union Members. 55 per cent are from California 24 per cent from Minnesota, and the remaining 21 per cent from the rest of the country. Average age = 43.2 years, education = 12.2 grade.

(7) ACCOUNTANT. ($N=345$, $\bar{X}=65.1$, $\sigma=29.18$). Includes 160 general accountants, 54 cost accountants, 65 auditors, and 66 comptrollers and treasurers. Average age = 37.4 years, education = 12.3 grade.

(8) OFFICE WORKER. ($N=317$, $\bar{X}=56.1$, $\sigma=34.22$). Includes 214 office clerks, bookkeepers, and stenographers; 92 office managers; and 20 credit managers. Average age = 33.2 years; education = 11.5 grade.

(9) LAWYER. ($N=251$, $\bar{X}=88.2$, $\sigma=44.68$). Includes 174 lawyers in general civil practice, 53 corporation lawyers, and 24 criminal lawyers, judges, and district attorneys. All members of the California Bar Association. Average age = 39.2 years; education = 17.0 grade.

(10) AUTHOR-JOURNALIST. ($N=249$, $\bar{X}=150.9$, $\sigma=107.5$). Authors so listed in Who's Who in America; newspaper editors so designated in Editor's and

Publisher's Yearbook. Includes 149 journalists, 68 authors of fiction, 25 authors of non-fiction, and 7 playwrights and poets. Average age = 45.0 years; education = 14.3 grade.

(11) GROUP V. (Social science teacher, minister, personnel, YMCA secretary, YMCA physical director, and city school superintendent). (N=600, X=63.15, o=49.24). Sample comprised of 100 of each of the above occupations. No average age or education available.

(12) GROUP IX. (Sales manager, life insurance salesman, and real estate salesman). (N=300, X=51.7, o=42.81). Sample includes 100 of each of the above occupations. No average age or education available.

(13) FOREST SERVICE. (N=405, X=125.5, o=37.37). Includes 190 District Rangers, 160 Forest Supervisors, and 60 Foresters. The blanks were obtained through P. P. Pitchlynn, Assistant Regional Forester, U. S. Forest Service, San Francisco. Average age = 38.5 years; education = 14.2 grade.

(14) PSYCHOLOGIST. (N=188, X=148.1, o=52.66). Full Members of the American Psychologist Association. Constitutes a sample of 35 per cent of all full members. Average age = 42.2 years; education = 19.0 grade.

(15) POLICEMAN. (N=25.4, X=110.4, o=57.31). From cities of Berkeley, Los Angeles, and Palo Alto, California; Cincinnati, Ohio; Duluth, Minnesota; and Wichita, Kansas. Average age = 34.8 years; education = 10.4 grade.⁴

A total of 57 scoring scales (47 occupations, 6 occupational group scales, and 4 nonvocational scales)⁵ are available for the SVIB. The 13 occupational scales and 2 group scales reported here were scored as part of the

⁴Ibid., p. 4.

⁵Buros, Oscar Krisen, editor, The Fifth Mental Measurements Yearbook, The Gryphon Press, N. J., 1959, p. 865.

Bozeman High School guidance program.

Having set forth a characterization of the 15 occupational criterion groups, it was possible to test statistically the null hypothesis that no significant difference exists between the means of the select group and the means of the criterion group. The method used is given in Chapter III.

CHAPTER III

STATISTICAL COMPARISON OF MEANS OF SELECT GROUP AND CRITERIA

As stated in the outline of the problem in conjunction with this paper, the null hypothesis is in effect a statement of no significant difference. In other words, the writer is saying that there was no significant difference between the means of the national criteria groups and the local Bozeman Senior High School students at the .01 (1%) level. The .01 (1%) level for a sample where $N = 80$ is 2.646 from the "t" (probability) table.¹ This means that any difference which exists is due to chance only one time out of a hundred times.

The method used, as outlined by Downie,² was concerned with whether or not the difference between two means was a real difference or whether it was a chance variation. The tests are referred to as tests of significance of differences.

The following were the sequential steps and formulations used to test the null hypothesis.
Calculating for σ (standard deviation):

$$s^2 = \frac{\sum X^2}{N} - \frac{(\sum X)^2}{N^2}$$

¹Downie, N. M., and Heath, R. W., Basic Statistical Methods, Harper & Brothers, New York, 1959, p. 265.

²Ibid., p. 124.

$$o = \sqrt{\frac{x^2}{N-1}}$$

Having determined o , the standard error of each of the means for uncorrelated data was determined:

$$s_{X_1} = \frac{o_1}{\sqrt{N_1}}$$

$$s_{X_2} = \frac{o_2}{\sqrt{N_2}}$$

The standard error of the difference between the two means was found from the following formula:

$$s_{DX} = \sqrt{s_{X_1}^2 + s_{X_2}^2}$$

The last step was to convert into "t" (standard score) units:

$$t = \frac{X_1 - X_2}{s_{DX}}$$

Using the method outlined above,³ the null hypothesis was rejected at the .01 (1%) level for each of the 15 groups tested. Table 1 presents data for specific occupations or occupational groups "t" scores.

³See Appendix C for illustration of problem.

TABLE 1. "t" SCORES FOR 80 BOZEMAN HIGH SCHOOL SENIOR BOYS, 1961, FOR 15 OCCUPATIONS AND OCCUPATIONAL GROUPS TESTED, AND THE REJECTION OF THE NULL HYPOTHESES

Areas	"t" Score	Null Hypothesis
Architect	16.98	Reject
Physician	14.70	Reject
Engineer	10.00	Reject
Chemist	10.90	Reject
Production Mgr.	14.80	Reject
Carpenter	9.81	Reject
Accountant	20.20	Reject
Office Worker	15.00	Reject
Lawyer	17.30	Reject
Author-Journalist	19.30	Reject
Group V	15.00	Reject
Group IX	13.90	Reject
Forest Service	14.50	Reject
Psychologist	23.70	Reject
Policeman	11.60	Reject

If the null hypotheses are rejected at the .01 (1%) level of significance, the conclusion remains that the difference between the means did not occur due to chance in 99 cases out of 100. From this rejection of the null hypotheses, reasonably astute conclusions may be drawn and recommendations made. These conclusions and recommendations are contained in Chapter IV.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

One of the major concerns of many who utilize tests as an appraisal device is the discriminatory power of the instrument being utilized. This was the reason which prompted the writer to investigate the Strong Vocational Interest Blank. The writer had long harbored the question: How well does the SVIB differentiate interests as measured, and is this difference due solely to chance, partially to chance, or other factors?

By rejecting the null hypothesis of no significant difference, the test interpreter can reasonably conclude that the instrument is properly discriminating.

SUMMARY

Accepting that the "doctrine of interest" is not only a fundamental cornerstone of any modern individualistic philosophy, but also one upon which many current educational theories are based, the writer endeavored to review and investigate one prominent measure of interest.

The review was based on the writings of Strong which included the manual furnished with the SVIB test. Burös revealed the dominance of the SVIB in the field of interest measurement. The writer proceeded to test the discriminatory

powers of the SVIB. This test of the discriminatory powers of the SVIB was based upon the null hypothesis of no significant difference between the means of the national norm group and senior boys in the Bozeman High School. Fifteen occupations and occupational groups were statistically explored. The null hypothesis was rejected in all fifteen cases at the .01 (1%) level of significance.

Conclusions

From this investigation, it may reasonably be concluded that the SVIB does discriminate between the interest patterns of the Bozeman senior boys and the national criteria group. It may further be concluded that this discrimination is not due to chance factors at the 1% level but rather to internal structural factors.

Recommendations

It is hoped that this investigation will stimulate further research of this nature wherever people are interested in the guidance and counseling fields. At the onset of this investigation, it was in the mind of the writer that national norms were not to be blindly accepted as applying in all situations. While results of this investigation tended to reinforce the writer's faith in one of the

basic guidance and counseling tools, it did not diminish the need for local research in the light of local circumstances. For example, this investigation gives rise to such questions as: Why do the Bozeman Senior High School boys score relatively high in such fields as forest service, engineering, and chemistry? Conversely, why do the Bozeman boys score relatively low in such areas as author-journalist, psychologist, and lawyer?

The Bozeman senior boys do not display interest in such areas as author-journalist, psychology, and lawyer that boys evidence over the country. Are these fields not of interest generally to high school students because of a certain maturity factor?

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APPENDIX

APPENDIX A

TABLE 1. RAW SCORE DATA ON SVIB FOR 80 BOZEMAN SENIOR-HIGH BOYS

Individ- ual	Arch.	Phys.	Eng.	Chem.	Prod. Mgr.	Carp.	Acct.	Offi. Work	Law- yer	Auth- Jour.	Grp.V	Grp. IX	For. Ser.	Psyc. Ser.	Pol- man
1.	-80	-116	-35	-104	8	-127	53	36	22	-84	-53	65	-111	-162	-97
2.	-21	-26	37	70	0	59	37	40	-69	-182	-12	-57	45	29	53
3.	-50	-24	13	16	0	-24	-8	5	-12	-160	8	13	46	-54	26
4.	-36	-41	-97	-88	-35	-135	-34	5	84	6	53	73	26	-57	24
5.	-26	-7	26	46	-15	-51	2	-2	1	-81	-50	-26	52	-34	22
6.	-78	-36	-7	-26	21	-102	32	36	48	-119	64	29	-5	-61	40
7.	57	25	68	32	-9	49	-32	-43	9	54	-108	-24	40	-21	18
8.	51	23	92	68	25	160	-24	-34	-53	-97	-65	-68	99	-13	91
9.	5	14	-9	-6	-22	-56	-12	0	19	-13	-42	10	55	-35	-25
10.	85	3	57	24	0	41	-34	-38	3	38	-60	5	42	-21	33
11.	20	23	119	121	32	11	41	20	4	-71	-69	-47	7	27	11
12.	68	64	108	50	23	70	-61	-80	12	48	-140	-31	9	-37	-56
13.	-3	-13	15	9	-7	-42	21	46	-3	-60	31	15	-8	-13	41
14.	-38	-106	-50	-50	15	-35	35	47	-41	-132	42	34	42	-43	-1
15.	11	-43	58	-9	29	-5	-11	-15	-22	-75	-39	6	37	-85	14
16.	12	13	115	48	58	92	-12	-32	-25	-68	-108	-19	66	-73	42
17.	62	17	101	89	40	39	-12	-21	-42	-148	-13	-35	92	38	58
18.	-25	-33	-9	-35	14	-58	25	6	44	-82	13	25	-7	-57	21
19.	67	23	62	15	-5	97	-56	-43	-18	-18	-76	-22	90	-52	43
20.	31	32	114	109	22	25	-14	-7	-51	-96	-31	-40	67	26	9
21.	-56	-45	23	-21	16	91	37	31	-60	-200	3	-45	110	-15	142
22.	48	-36	-31	-37	-33	-61	-19	-12	17	34	55	17	-12	9	-44
23.	-40	-56	-44	-85	0	17	-32	-20	-15	-80	-46	82	-7	-176	-14
24.	21	12	133	98	24	53	-4	-10	-24	-154	40	-42	96	2	108
25.	60	69	105	96	19	28	-17	32	-16	-45	-91	-63	29	-1	-27
26.	37	8	-8	-17	10	-15	-41	-1	-28	26	-2	22	30	-30	22
27.	-14	20	-2	43	-25	-3	-1	-11	15	-80	11	-13	82	-14	68

TABLE 1. (cont.)

Individ- ual	Arch.	Phys.	Eng.	Chem.	Prod. Mgr.	Carp.	Acct.	Offi. Work.	Law- yer	Auth. Jour.	Grp.V	Grp. IX	For. Psyc. Pol- Ser. man		
28.	-43	-45	26	7	0	63	19	19	-47	-182	35	-27	144	-36	89
29.	-19	-36	56	10	24	72	10	9	-28	-78	-51	-1	13	-41	28
30.	-48	-56	8	-44	23	-6	0	-1	40	-119	-3	32	64	-102	40
31.	75	24	114	71	10	76	-31	-40	-24	-24	-105	-46	54	-19	15
32.	75	55	115	116	34	35	-5	-48	33	-23	-79	-23	53	37	13
33.	1	13	71	40	21	97	-11	-8	-50	-151	-53	-48	95	2	91
34.	-150	-32	33	-34	31	42	-1	-12	-22	-115	-6	-5	116	-118	142
35.	1	29	44	62	21	-25	-5	-18	1	-63	-13	-10	-3	-5	-15
36.	47	0	69	107	-5	19	7	-14	-13	-68	13	-61	34	93	22
37.	-6	31	96	88	52	29	5	-31	-20	-118	-51	-25	67	8	56
38.	-70	-38	-8	-41	24	25	33	48	-1	-129	-14	6	35	-94	68
39.	16	-17	70	36	32	48	-8	-20	-42	-79	-41	-12	21	-6	55
40.	38	-6	47	35	-8	-66	1	-3	53	-13	-29	-8	13	-24	-19
41.	59	2	17	18	-22	28	-32	4	-27	-77	-27	-33	63	-27	56
42.	122	52	143	79	29	51	-17	-42	-14	42	97	-18	26	89	-63
43.	54	40	101	78	14	14	-46	-78	15	37	-118	-30	73	3	-30
44.	-23	-55	15	-42	28	55	15	17	-29	-56	-54	60	39	-130	-16
45.	-27	-48	36	-30	6	72	-5	-4	-50	-141	-43	12	77	-120	43
46.	-51	-5	104	69	51	103	8	30	-53	-172	-63	-42	85	-73	120
47.	-2	-20	-65	74	25	106	7	9	-73	-196	5	-56	131	3	136
48.	68	50	47	13	-20	21	-48	-54	5	42	-74	-39	37	-33	-9
49.	-9	-41	-6	-15	10	-69	-13	-3	29	-94	61	26	60	-3	-18
50.	62	63	125	88	37	9	-11	-38	49	84	-126	-32	-29	25	-24
51.	-84	-46	-50	-60	-2	-24	42	58	21	-117	53	1	73	-86	94
52.	30	27	62	17	17	101	-32	-40	-31	-63	-52	-25	86	-49	77
53.	-47	-34	30	11	55	123	31	41	-83	-222	22	-31	125	-55	144
54.	-34	-56	-49	-72	-5	-69	37	19	29	-45	-24	20	-44	-76	-29

TABLE 1. (cont.)

Individ- ual	Arch.	Phys.	Eng.	Chem.	Prod. Mgr.	Carp.	Acct.	Offi. Work.	Law- yer	Auth. Jour.	Grp.V	Grp.IX	For. Psyc. Ser.	Pol- man	
55.	-3	-55	25	11	-3	45	0	3	-72	-126	-26	-36	93	-6	63
56.	55	57	122	148	22	41	17	-1	-42	-70	-32	-77	50	101	0
57.	48	36	38	47	-17	14	-15	-25	-32	-49	-2	-69	55	35	-43
58.	7	16	48	14	0	103	1	-16	-25	-46	-69	-33	41	-64	28
59.	125	68	124	139	-9	46	-32	-50	-18	21	-66	-49	68	87	-25
60.	106	46	130	38	17	99	-53	-24	-37	-40	-91	-45	42	-7	2
61.	4	10	40	32	7	24	13	-8	4	-45	-39	-13	8	-24	34
62.	35	-8	1	-12	-4	-24	3	15	25	-8	-6	29	49	-45	-9
63.	-11	-42	51	-2	25	134	-13	29	-102	-173	-14	-33	101	-102	114
64.	-42	-2	51	41	25	53	0	12	-52	-159	-14	-50	82	-137	75
65.	-17	4	14	7	-2	-77	-39	-66	109	80	-21	25	9	43	-41
66.	-28	-66	-89	-92	-60	-147	17	36	73	31	76	42	-33	-25	-57
67.	56	54	50	97	-22	-99	-16	-47	142	125	-34	-30	6	105	-33
68.	132	100	111	101	-1	16	-48	-64	35	160	-116	-40	0	58	-53
69.	-81	-40	-73	-76	-27	-59	9	51	13	-63	42	14	11	-85	35
70.	-95	-93	-53	-46	-8	-58	53	37	4	-128	31	69	16	-78	39
71.	-115	-77	-41	-27	27	10	30	67	-57	-188	41	39	71	-63	91
72.	-34	27	61	63	47	103	-14	-8	-62	-208	12	-40	120	-21	97
73.	53	52	96	103	12	28	-18	-22	11	20	-94	-32	40	0	-25
74.	49	33	128	118	24	68	4	-25	-41	-123	-39	-58	92	29	30
75.	-74	-33	40	31	33	-20	55	27	-53	-203	-22	-9	92	-68	77
76.	6	-14	33	31	-19	47	-10	-29	-37	-82	-72	-43	24	-21	0
77.	77	35	111	66	55	121	-15	-38	-52	-67	-90	-47	83	-8	35
78.	-49	2	52	68	19	77	3	-5	-78	-219	8	-64	127	-21	80
79.	68	51	3	18	-51	-31	-46	-34	16	81	-56	9	44	-8	4
80.	-21	-1	-2	13	3	48	-15	-4	6	-96	-2	-37	36	-8	85

APPENDIX B

Means and Standard Deviations for Criteria Group and Bozeman Senior-Hi Boys on SVIB

Occupation	National Norms					Bozeman Boys				
	N	X	O	N	EX	(EX) ²	EX ²	X	O	
Architect	241	124.3	49.5	80	554	306916	243020	6.9	54.8	
Physician	337	76.3	41.4	80	-225	50625	151671	-2.8	43.7	
Engineer	513	109.3	42.4	80	3276	10732176	406254	40.9	58.7	
Chemist	297	101.8	41.9	80	2068	4276624	324268	25.8	58.6	
Prod. Mgr.	216	59.5	30.5	80	780	608400	51477	9.8	23.6	
Carpenter	181	99.2	44.9	80	11668	27822224	369862	20.8	65.1	
Accountant	345	65.1	29.2	80	-320	102400	58918	-4.0	27.0	
Off. Worker	317	56.1	34.2	80	-440	193600	86110	-5.5	32.6	
Lawyer	251	88.2	44.7	80	-855	731025	163764	-10.7	44.2	
Auth.-Jour.	249	150.9	107.5	80	-5656	31990336	943950	-70.7	83.0	
Group V	600	63.2	49.2	80	-2199	4835601	263945	-27.5	51.0	
Group IX	300	51.7	42.8	80	-1159	1343281	120843	-14.5	36.3	
Forest Ser.	405	125.5	37.4	80	3816	14561856	339789	47.7	44.7	
Psychol.	188	148.1	52.7	80	-1984	3936256	289248	-24.8	55.1	
Policeman	254	110.4	57.3	80	2291	5248681	295339	28.6	53.9	

¹Strong, Edward K. Jr., Manual for Vocational Interest Blank for Men, Stanford University Press, Stanford University, California, January, 1945.

APPENDIX C

Calculations in Accepting or Rejecting the Null
Hypothesis of No Significant Difference
Between the Means for Architects

Where:

$$N = 80$$

$$X = 554$$

$$X^2 = 306,918$$

$$X^2 = 243,020$$

$$X = \text{Mean} = \frac{X}{N} = \frac{554}{80} = 6.92$$

Solving for standard deviation:

$$s = \sqrt{\frac{x^2}{N-1}}$$

When:

$$\begin{aligned} x^2 &= X^2 - \frac{(X)^2}{N} \\ &= 243,020 - \frac{306,916}{80} \\ &= 243,020 - 3940 \\ &= 239,080 \end{aligned}$$

Therefore:

$$\begin{aligned} s &= \sqrt{\frac{239,080}{79}} \\ &= \sqrt{3014} \\ &= 54.85 \end{aligned}$$

APPENDIX C (cont.)

Having solved for σ , one can now calculate the standard errors of the two means, the difference of which is being tested:¹

$$\begin{aligned}
 S_{X_1} &= \frac{\sigma_1}{\sqrt{N_1}} & S_{X_2} &= + \frac{\sigma_2}{\sqrt{241}} \\
 &= \frac{54.85}{8.94} & &= \frac{49.54}{15.52} \\
 &= 6.14 & &= 3.19
 \end{aligned}$$

Solving for the standard error of the difference between two means for uncorrelated data:

$$\begin{aligned}
 S_{D_X} &= \sqrt{S_{X_1}^2 + S_{X_2}^2} \\
 &= \sqrt{(6.14)^2 + (3.19)^2} \\
 &= \sqrt{37.7 + 10.18} \\
 &= \sqrt{47.88} \\
 &= 6.92
 \end{aligned}$$

Solving for z when D_X = the difference between the two means:

$$z = \frac{D_X}{S_{D_X}} = \frac{117.4}{6.92} = 16.98$$

¹Downie, N. M., and Heath, R. W., Basic Statistical Methods, Harper & Brothers, New York, 1959, p. 124.

APPENDIX C (cont.)

Using standard "t" tables,² the quantity 16.98 is found to yield an extremely small probability of a chance occurrence; therefore, the null hypothesis is rejected.

²Fisher, R. A. and Yates, F., Statistical Table for Biological, Agricultural, and Medical Research, Oliver and Boyd, Ltd., Edinberg, Scotland, n.d.