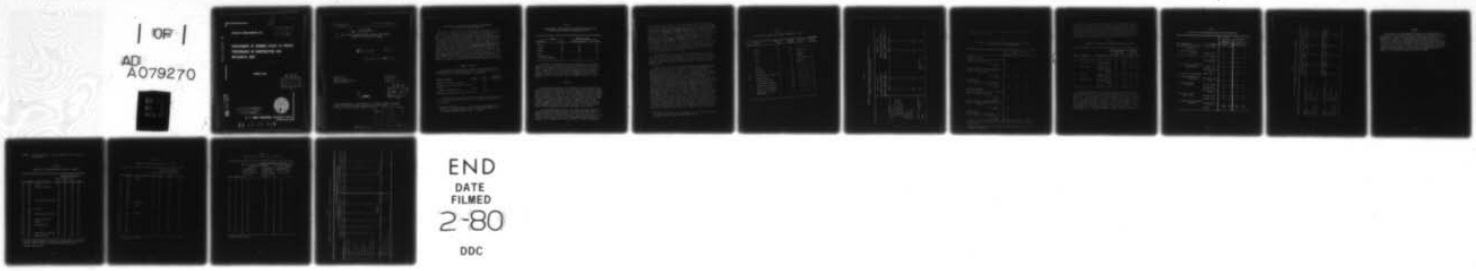
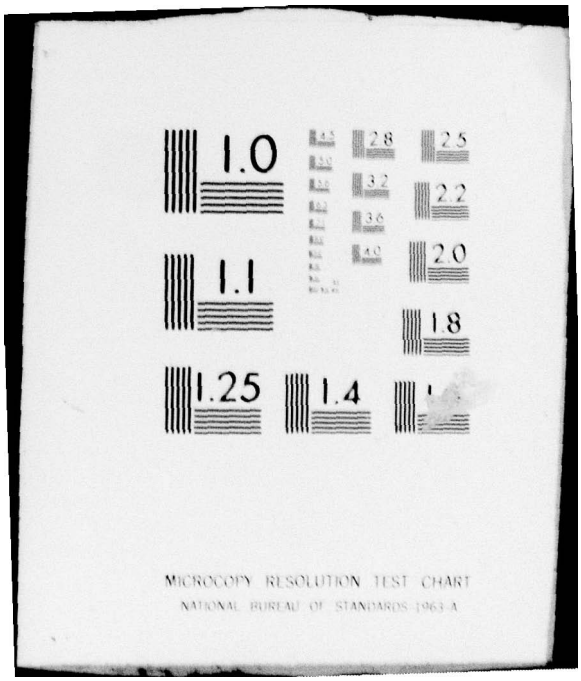
AD-A079 270 ARMY PERSONNEL RESEARCH OFFICE WASHINGTON DC F/G 5/9
DEVELOPMENT OF INTEREST SCALES TO PREDICT PERFORMANCE IN CONSTR--ETC(U)
AUG 66 W H HELME
UNCLASSIFIED APRO-RM-66-6 NL



END
DATE FILMED
2-80
DDC


1.0
1.1
1.25
1.4
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Exp. Tests

MC

LEVEL II

RESEARCH MEMORANDUM 66-6

DEVELOPMENT OF INTEREST SCALES TO PREDICT PERFORMANCE IN CONSTRUCTION AND MECHANICAL MOS

040 650

AUGUST 1966

U. S. ARMY PERSONNEL RESEARCH OFFICE

Army Project Number
2J024701A722

New Classif Techniques e-12

(9) Research memorandum 66-6

(6) DEVELOPMENT OF INTEREST SCALES TO PREDICT PERFORMANCE IN CONSTRUCTION AND MECHANICAL MOS

(10) William H. Helme

(12) 16

(14) APRO-RM-66-6

Submitted by:
Edmund F. Fuchs
Chief, Military Selection
Research Laboratory

Approved by:
J. E. Uhlaner
Director
USAPRO Laboratories

(11) Aug[redacted]66

Research Memorandums are informal reports on technical research problems. Limited distribution is made, primarily to personnel engaged in research for the U. S. Army Personnel Research Office.

040 650

DEVELOPMENT OF INTEREST SCALES TO PREDICT PERFORMANCE IN CONSTRUCTION AND MECHANICAL MOS

Research to improve enlisted classification has included an effort to measure the occupational interests and goals of the new recruit in order to enhance prediction of MOS training and job performance. As a part of this effort in the broad mechanical domain, the Army Job Activities Questionnaire-Mechanical (AJAQ-M) was constructed and administered to samples of general Army enlisted input. Initial findings on the relationships between specific job activity valences, preferences as to job conditions, expressed interest in given jobs, and related pre-service experience have been reported elsewhere.[1] The earlier report discussed motivational factors and scales obtained from internal item analysis on AJAQ-M. The next step was to administer the measure to samples of input to selected training courses so as to obtain item validity coefficients for both training and job performance evaluations. The present publication presents the findings from the item analysis and describes the development of empirically valid scales which are to be validated on independent samples in the next research stage.

METHOD OF ATTACK

The AJAQ-M was administered to samples of men entering advanced individual training in five MOS (Table 1.). Variables consisted of the 179 items of the instrument, which were of four types:

Types of Content	Section	Items	Number of Alternatives
Specific job activity valences	I	100	4
Preference for job conditions, requirements	II	50	2
Valences of described jobs	III	11	2
Experience in particular job activities	IV	18	2

Each item was correlated with the two criteria: MOS training course grade and job performance ratings about 7 or 8 months after completion of training.

[1] Helme, W. H. and Katz, Aaron. Construction of Experimental Interest Measures for Enlisted Classification. Research Memorandum 65-2. U. S. Army Personnel Research Office. May 1965.

Table 1

SAMPLES USED TO DERIVE SCALES OF VALID ITEMS FROM ARMY JOB ACTIVITIES QUESTIONNAIRE, MECHANICAL (AJAQ-M)

MOS		Number of Cases	
Designation	No.	Training Criterion	Job Criteria
Pioneer	12A	139	116
Wireman	36A	104	75
Lineman	36C	186	130
Welder	44C	117	94
Engineer Missile Equipment Specialist	62C	105	81

In addition to identifying the more valid items in each criterion sample, the relationship of item validity to item factorial content as derived in the earlier analysis (Helme and Katz, op. cit.) was investigated. Since the factor scales represented psychological constructs, validity estimates of sets of items from homogeneous scales might be expected to be more stable than validity estimates of sets of items selected purely on the empirical basis of single-item validity coefficients.

RESULTS

Item validity coefficients were obtained for each item against ten criterion measures--training and job evaluations in each of the five MOS. Initial analysis showed that there were few items with consistent validity across all samples, or even with validity consistent for both the training and job criteria on a single MOS. This result raised a question whether the item coefficients on single samples were sufficiently stable to afford a basis for a scale, particularly in view of the facts that (1) the job criterion samples were composed entirely of members of the training criterion samples, and (2) the training and job criteria in a given MOS were presumably positively correlated. Moreover, on a practical basis, little was to be gained by deriving 10 different "valid" scales.

In an effort to obtain empirical scales with reasonable prospect of stable validity from sample to sample, the relation of item validity to factorial content was next explored, using data on the 100 items of Section I (specific job activity valences). When attention was restricted to the items of a single factor set, there appeared to be consistent results. These factor sets are shown in Table 2. Within the Power set

of items, consistent validity for job performance in MOS 12A (Pioneer), 36A (Wireman), and 44C (Welder) was found for the factor subsets of Manual Construction, Construction Equipment Operation, and Carpentry Tools, while the subset of Installation and Repair, and the items loading on the Power factor only, were generally of lower validity (Table 3). On the other hand, for the criterion of training performance in MOS with some electrical content, 36A (Wireman), 36C (Lineman), and 62C (Engineer Missile Equipment Specialist), the Danger and Technical items tended toward better validity while the Discomfort factor items were markedly less valid. Miscellaneous items not loaded on any of these factors showed consistently low validity for both criteria. Accordingly, two empirically valid scales were derived: A Mechanical Job Performance Scale of 20 items selected from the Power factor sets, and an Electrical Training Performance Scale of 20 items selected from the Danger and Technical factor sets. [2] The scales are shown in Tables A-1 and A-2.

The items of Section II, job condition preferences, were analyzed next. Some consistency of validity was found for the electrical training criteria, but the job performance criteria did not yield consistent results. Instead, a moderate agreement in validity coefficients appeared between the two MOS involving heavy construction: Pioneer (12A) and Lineman (36C).

Another Army Job Activities Questionnaire had been constructed and tried out for the medical and chemical fields--Biochem (AJAQ-BC). This instrument contained the same Section II as the AJAQ-M, inasmuch as general job conditions may be found across a wide range of jobs. Item validity data for training performance in four MOS samples were examined: 54A (Chemical Operations Apprentice), 91A (Medical Corpsman), 91B (Medical Specialist), and higher skill MOS in the 91 (Medical Care and Treatment) and 92 (Laboratory Procedures) career groups. High consistency of validity was found for the lower skill MOS (Chemical Operations Apprentice and Medical Corpsman) and moderate consistency between these and one or both of the MOS groups in the AJAQ-M analysis. Moreover, the valid responses tended to be in the same direction for both the chemical-medical and the electrical and construction samples; preference for the higher technical level of achievement was positively related to the performance criteria. Therefore, a Medical-Technical Scale of 20 items was assembled (Table A-3). The consistency of level of validity across the three criteria is shown in Table 4. Of the items selected across these criteria, 85% are above the median validity for chemical-medical MOS and about two-thirds are above the median for electrical and construction MOS. Half the items selected are above the 70th percentile of the respective distribution of validity coefficients. Incidentally, there was little relation to the factor scale obtained from earlier analysis of Section II (Mechnical Blue Collar vs. Technical White Collar)--there

---

[2] One highly valid item from the Discomfort set was included in place of possible borderline items from the other two sets.

Table 2

FACTOR SCALES DERIVED FROM INTERNAL ANALYSIS OF AJAQ-M

Section	Major Factor	Number of Items	Average Loading	Secondary Factor	Average Loading
I	Power	11	.55	----------	----
	Power	8	.56	Manual Const	.32
	Power	10	.54	Install & Repair	.32
	Power	6	.56	Const Equip Op	.35
	Power	4	.62	Carpentry Tools	.35
	Danger	18	.53	----------	----
	Technical	14	.55	----------	----
	Discomfort	9	.61	----------	----
II	Mechanical vs. Technical	17	.57	----------	----
III	Manual Skills	3	.50	----------	----
	Heavy Construction	3	.47	----------	----
	Installation & Maint	4	.62	----------	----
IV	Manual Skill Experience	5	.64	----------	----
	Heavy Const Experience	4	.55	----------	----
	Installation & Maint Experience	4	.50	----------	----

Table 3

FACTORIAL CONTENT OF MORE VALID AND LESS VALID ITEMS OBTAINED FROM AJAQ-M,
SECTION I - SPECIFIC JOB ACTIVITY VALENCES

Factor Set	Number of Items Mechanical Job Performance Pioneer Wireman Welder (MOS 12A), (MOS 36A), (MOS 44C) rz.11	rc.11		Number of Items Electrical Training Performance Wireman Lineman Engr. Msl. Equip. Sp (MOS 36A), (MOS 36C), (MOS 62C) rz.06	rc.06
Power, General	4	7		1	10
Manual Construction	6	2		0	8
Installation & Repair	0	10		1	9
Const Equip Operation	6	0		0	6
Carpentry Tools	3	1		0	4
Danger	1	17		12	6
Technical	2	12		10	4
Discomfort	0	9		2	7
Miscellaneous	5	15		1	19
	27	73		27	73
Power (except Installation & Repair)	19	10	Danger & Tech	22	10
Other	8	63	Other	5	63

were only 4 items in common between the two scales, whereas 6.8 would be expected by chance alone.

Table 4

COMPARISON OF ITEMS MEETING GIVEN VALIDITY CRITERIA ACROSS THREE MOS GROUPS AND ITEMS REJECTED

		Number of Items		
		Accepted	Rejected	Total
Training Criterion				
Chemical Operations Apprentice (MOS 54A), Medical Corpsman (MOS 91A)				
r .06[a]	Above	17	8	25
	Below	3	22	25
Wireman (MOS 36A), Lineman (MOS 36C), Engineer Missle Equipment Specialist (MOS 62C)				
r .06[a]	Above	14	11	25
	Below	6	11	25
Job Criterion				
Pioneer (MOS 12A), Lineman (MOS 36C)				
r .04[a]	Above	13	12	25
	Below	7	18	25
Training Criterion				
Chemical Operations Apprentice (MOS 54A), Medical Corpsman (MOS 91A)				
r .22[b]	Above	10	5	15
	Below	10	25	35
Wireman (MOS 36A), Lineman (MOS 36C), Engineer Missle Equipment Specialist (MOS 62C)				
r .12[b]	Above	11	4	15
	Below	9	26	35
Job Criterion				
Pioneer (MOS 12A), Lineman (MOS 36C),				
r .07[b]	Above	10	5	15
	Below	10	25	35

[a] Median validity coefficient of all Section II items for the criterion indicated.

[b] 70th percentile validity coefficient of all Section II items for the criterion indicated.

Analysis of particular job valences (Section III) revealed little evidence of validity for either training or job performance. Table 5 shows that expressed positive attitude toward given jobs has very modest predictive value for related jobs. In the one case where the job on which degree of preference was expressed is the same as the job on which the item was validated (Lineman), the validity for training performance was highest (.21). But the validity for job performance was only .05, and all other coefficients were of negligible size (see Table A-4).

Table 5

VALIDITY OF PARTICULAR JOB VALENCE FOR MOS PERFORMANCE

Item	Occupation	Related MOS	Average Validity Coefficient			
			Related MOS		Other MOS	
			Training	Job	Training	Job
51	Carpenter, rough	Pioneer (12A)	-.11	-.09	-.07	.02
54	Heavy Const Spec	Pioneer (12A)	.06	-.08	-.06	-.05
		Lineman (36C)	.06	-.01	-.06	-.05
58	Electrician	Wireman (36A)	.14	-.11	-.02	-.14
		Lineman (36C)	.02	.05	-.02	-.14
		Engr Msl Eq Sp (62C)	-.05	-.06	-.02	-.14
59	Lineman	Wireman (36A)	.05	-.11	-.03	-.11
		Lineman (36C)	.21	.05	-.03	-.11
60	Heat & Vent Sp	Welder (42C)	.09	-.03	-.02	.01
		Engr Msl Eq Sp (62C)	-.05	.01	-.02	.01
		Average	.04	-.04	-.04	-.05

Analysis of job-related pre-service experience (Section IV) also yielded modest validity for performance in MOS which included such duties (Table 6). Again, in one instance in which the experience was in the major duty of the MOS (Welder), validity coefficients of .29 for training and .17 for job performance were found. Another case--telephone line-work for Linemen--yielded a coefficient of .13 for training and -.01 for job performance. The three experience factors from the earlier analysis showed only a modest degree of positive validity for some MOS training courses (Table 7). In general, however, results from analysis of Sections III and IV of AJAQ-M suggested no valid scales for further study.

Table 6

VALIDITY OF JOB RELATED EXPERIENCE FOR MOS PERFORMANCE

Item	Experience	Using MOS	Validity Using MOS Training	Validity Using MOS Job	Coefficient Other MOS Training	Coefficient Other MOS Job
62	Build Concrete forms, scaffolds	Pioneer (12A)	.07	-.01	.22	.06
66	Construct in brick, concrete	Pioneer (12A)	.01	.07	.07	.02
68	Weld, rivet, bolt	Welder (44C or 42C)	.29	.17	.05	.10
		Engr Msl Eq Sp (62C)	.01	-.25	.05	.10
69	Move heavy objects with rigging gear	Lineman (36C)	.02	.11	.09	.02
		Engr Msl Eq Sp (62C)	.18	-.15	.09	.02
72	Cut, bend, thread pipes	Welder (44C)	.13	-.05	.14	.04
73	Install, maintain air conditioners	Engr Msl Eq Sp (62C)	-.08	-.04	.03	-.01
74	Install wiring, lighting	Wireman (36A)	.09	-.08	.04	.06
		Lineman (36C)	.20	.08	.04	.06
		Engr Msl Eq Sp (62C)	.11	-.10	.04	.06
75	String telephone lines, etc.	Wireman (36A)	-.04	-.04	.00	.04
		Lineman (36C)	.13	-.01	.00	.04
76	Install, repair heating ventilation	Engr Msl Eq Sp (62C)	.17	-.17	.03	.12
		Average	.09	-.03	.07	.05

Table 7

VALIDITY OF JOB-RELATED EXPERIENCE FACTORS FOR MOS PERFORMANCE

Items	Experience Factor	Average Validity Coefficient for MOS Training: Pioneer (12A)	Wireman (36A)	Lineman (36C)	Welder (44C)	Engr Msl Eq Sp (62C)
62-66	Carpentry	.06	.07	.12	.10	.11
67-70	Heavy Construction	.00	.08	.09	.17	.04
71-72, 75-76	Crafts	-.06	.05	.18	.12	.09
73-74, 77-79	Miscellaneous	-.04	-.04	.16	.03	.05

Items	Experience Factor	Average Validity Coefficient for Job Performance: Pioneer (12A)	Wireman (36A)	Lineman (36C)	Welder (44C)	Engr Msl Eq Sp (62C)
62-66	Carpentry	.03	.06	.08	.12	-.16
67-70	Heavy Construction	-.02	.09	.13	.09	-.11
71-72, 75-76	Crafts	.07	.11	.08	.04	-.08
73-74, 77-79	Miscellaneous	.06	-.04	.10	-.05	-.05

SUMMARY

Item analysis of AJAQ-M against training and job performance in five construction and mechanical MOS yielded two potentially valid scales from Section I (specific job activities)--Electrical Training Scale and Mechanical Job Scales. Additional data from AJAQ-BC on Section II which is the same in both instruments yielded a Medical-Technical Scale of promise. Particular job valences (Section III) and job activity experience reported (Section IV) showed little predictive value. The three empirical scales are being cross-validated on new mechanical MOS samples, along with the psychological construct scales obtained from factor analysis of item intercorrelations reported elsewhere.

APPENDIX. Item validity data on scales developed for construction and mechanical MOS

Table A-1

MECHANICAL JOB PERFORMANCE SCALE, AJAQ-M: SECTION I

Item	Responses	Factor Category[a]	Validity Coefficient[b] Pioneer (12A)	Wireman (36A)	Welder (42C)	Average
19	AB	General	-05	21	08	08
32	AB	Manual Construction	14	20	-01	11
34	AB	"	02	27	-07	07
38	AB	"	11	18	18	16
41	AB	"	02	25	05	11
54	AB	"	09	18	13	13
59	AB	Const. Equip. Operation	02	04	15	07
61	AB	"	05	17	02	08
64	A	"	-02	30	16	15
67	AB	General	06	11	00	06
68	AB	"	12	17	01	10
69	AB	Const. Equip. Operation	-04	06	21	08
70	AB	"	01	20	12	11
71	AB	Manual Construction	04	21	06	10
79	AB	General	00	15	02	06
82	AB	Carpentry Tools	-02	13	09	07
89	AB	"	-07	10	19	07
93	AB	"	11	23	03	12
98	AB	Const. Equip. Operation	06	22	-05	08
99	AB	Carpentry Tools	02	25	-18	03

[a] All items load on General Power Factor; category listed is secondary Factor. "General" means no loading on any secondary factor.

[b] Decimal points omitted.

Table A-2

ELECTRICAL TRAINING SCALE, AJAQ-M: Section I

			Validity Coefficient[a]			
			Wireman	Lineman	Engr Msl Eq Sp	
Item	Response	Factor Category	(36A)	(36C)	(62C)	Average
6	ABC	Danger	01	24	14	13
16	AB	"	24	11	20	18
24	ABC	"	14	16	06	12
28	AB	"	16	09	08	11
30	AB	"	06	14	25	15
31	ABC	"	05	12	23	13
33	ABC	"	08	20	14	14
35	ABC	"	04	09	20	11
43	AB	"	10	22	01	11
45	ABC	Discomfort	04	18	34	19
52	AB	Danger	21	17	18	19
76	AB	"	27	07	11	15
10	AB	Technical	32	09	-08	11
11	AB	"	32	17	17	22
63	AB	"	34	15	15	21
88	AB	"	20	04	14	13
90	A	"	06	18	18	14
95	AB	"	27	15	16	19
97	AB	"	15	15	15	15
100	AB	"	35	16	16	22

[a] Decimal points omitted.

Table A-3

MEDICAL-TECHNICAL SCALE, AJAQ: SECTION II

Item	Response	Average Validity Coefficient[a]		
		Training MOS Criterion		Job MOS Criterion
		Chem-Med	Electrical	Construction
		Chem Opns Appr. (54A), Med Corpsman (91A)	Wireman (36A), Lineman (36C), Engr Msl Eq Sp (62C)	Pioneer (12A), Lineman (36C)
1	A	24	16	06
3	A	32	15	08
7	B	21	03	14
10	A	16	-04	02
12	A	20	15	08
15	A	34	14	20
17	A	22	01	10
23	A	16	13	16
30	A	26	25	09
31	B	28	12	-01
33	A	09	08	14
35	A	18	08	04
42	A	22	01	00
43	A	07	22	07
44	B	23	12	02
45	B	26	04	-02
47	A	23	13	13
48	B	32	07	05
49	B	19	06	04
50	B	16	00	00

[a] Decimal points omitted.

Table A-4

VALIDITY OF OCCUPATIONAL VALENCES, AJAQ: SECTION III FOR MOS PERFORMANCE

Item	Occupation	Validity Coefficients[a] Training MOS Criterion: Pioneer (12A)	Welder (42C)	Wireman (36A)	Lineman (36C)	Engr Msl Eq Sp (62C)	Job MOS Criterion: Pioneer (12A)	Welder (42C)	Wireman (36A)	Lineman (36C)	Engr Msl Eq Sp (62C)
51	Carpenter, rough	-11	-14	00	01	-14	-09	-15	21	04	-04
52	Carpenter, finish	-03	-04	-03	-03	00	-02	03	14	16	-08
53	Mason	-08	-11	-06	-02	-04	-12	-10	04	-02	-11
54	Heavy Const Spec	06	-12	03	08	-08	-08	-12	08	-01	-11
55	Const Mach Op	-13	13	02	03	05	01	-03	16	01	-04
56	Plumber	-17	-09	-08	02	03	-09	-01	16	00	-10
57	Refrigeration Spec	-08	10	-07	10	-12	12	00	14	08	01
58	Electrician	02	-06	14	02	-05	-17	-10	-11	05	-06
59	Lineman	07	-22	05	21	08	-07	-19	-19	-02	-14
60	Heat & Ventil Spec	-06	09	-15	14	-05	-02	-03	01	03	01
61	Water Supply Spec	-01	-06	15	17	-23	-03	-11	-01	00	-09

Factor	Training: Electrical	Training: Mechanical	Job: Electrical	Job: Mechanical
Manual Skills	- 03	- 07	- 04	- 01
Heavy Construction	05	- 01	- 03	- 05
Installation & Maintenance	01	- 02	01	- 02

[a] Decimal points omitted.