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ABSTRACT

This article describes the author's efforts to build a combined job-preference/job-preview measure as an alternative to conventional interest inventories for use in U.S. Navy recruiting, as most applicants have no previous exposure to Navy-specific jobs. Criteria for building a successful instrument (i.e., JOIN) that can identify the best match between the Sailor and his/her assigned job are presented. The resulting taxonomy (i.e., JOIN's classification of Navy jobs based on Community (e.g., aviation), Work Styles/Environments (e.g., outdoor), and specific Work Activity process-content pairs (e.g., maintain mechanical equipment)), is described. Psychometric properties of JOIN are presented based on data from 6,988 U.S. Navy Sailors, as well as gender differences and factor structure. Preliminary evidence of JOIN's predictive validity with five service-related outcome measures is presented, with modest yet significant findings. Although the development of JOIN may be considered non-traditional, JOIN promises to have a direct impact on training, promotion, and retention.

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What is the public significance of this article?—An organization's effectiveness is based on the people who-comprise it. Thus, selection and placement of personnel directly impact that effectiveness. Historically, cognitive testing has been the dominant tool for these purposes. However, cognitive tests have been shown to be limited in predicting elements of success beyond technical proficiency. They do not predict well those aspects of performance which depend on the individual'smotivation to perform well over time, or to remain with the organization over time. For these outcomes, noncognitive attributes such as personality and vocational interests provide critical predictive information. This special issue demonstrates the effectiveness of personality and interest measures in a military context, and how these tools are transforming the military selection and classification process. The effort reported in this issue marks major changes in the selection and classification process, changes that can help both military and civilian organizations be more productive and successful.

Measuring vocational interests for use in job counseling has been the focus of substantial research for over 90 years (Betsworth & Fouad, 1997) but has met with limited sustainable success in the military personnel classification context (Ingerick & Rumsey, 2014; Watson, 2002; Watson 2016). While the apparent utility of having a valid and effective measure of an applicant's perceived job interest is fairly evident in a classification context (Holland, 1996), it was the case that none of the previously developed and available interest measures were in use by the United States Military in the late 1990's. As a result, the author was tasked with investigating and identifying or developing a useful, sustainable instrument for the U.S. Navy (Watson, 2002). To this end, an extensive review of literature was performed (see Farmer et al., 2006a) that described a wide collection of interest inventories, many but not all of which had been implemented in some context. The literature presented in Farmer et al. (2006a) was very similar to points made by Ingerick and Rumsey (2014):

(1) Some interest measures have been presented as having evidence of identifying person-job fit for a subset of jobs, but none has been clearly successful in differentiating between all jobs in a classification context. This includes both the Air Force Vocational Interest Career Examination (VOICE) (Alley & Matthews, 1982), and the Army's Vocational Interest Career Examination (AVOICE) (Hanson, Paullin, Bruskiewicz, & White, 2003).
(2) Military jobs change frequently; an effective methodology for interest measurement must by readily adaptable.

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(3) While claims of predictive validity are made for a variety of instruments, no clear demonstration of their independent ability to predict meaningful organizational performance metrics exist in a classification context (such as training success, promotion rates, and desired retention).

In addition to these observations, it was apparent that despite being by far the most popular model of vocational interest, a RIASEC (Realistic, Investigative, Artistic, Social, Enterprising, Conventional) model (Holland, 1985) as it stands is too limited for our purposes in military personnel classification (see Farmer et al., 2006b for a related discussion). This belief is based on two principal observations:

(1) The number of unique possible combinations of the RIASEC coding is relatively small. All possible (unconstrained) coding combinations result in a theoretic maximum of 120 if order is important. The number shrinks from there as additional constraints are added. If we assume that it is not possible to simultaneously have both ends of any axis, the theoretic maximum immediately shrinks to 48. If the objective is to be able to create unique goodness of fit metrics for between 70–100 Navy jobs (commonly known as ratings), it is unlikely that an instrument built around this methodology could provide adequate discriminability.
(2) Research using RIASEC coding has demonstrated that over half of Navy and Army jobs are in the Realistic category (Holland, 1986). It is therefore unclear how a RIASEC model would provide adequate discriminability for our purposes.

In summary, when considering interest inventories, we did not find any instruments that were suitable or readily adaptable for U.S. Navy purposes. Rather than describing here how each of the instruments did not meet our objectives, we will focus on describing the design and development of Job Opportunities in the Navy (JOIN), an instrument developed specifically to measure interest in Navy jobs. In addition, using a combination of quantitative and qualitative evidence, we describe how JOIN shows promise in meeting the Navy's needs in accordance with the following nine design criteria:

(1) Discriminative. Ideally, the instrument must be able to differentiate among Navy enlisted ratings, as suitable for classification. However, to the degree that two ratings are similar in terms of their work and context, they may be equally desirable.
(2) Sustainable. Must allow for changes in rating structure without extensive revalidation.
(3) Parsimonious. Must feature the fewest number of elements that provide a unique description of each rating.
(4) Fast. An arbitrary but informed time limit was set as twenty minutes.
(5) Modular. Must provide standalone results, as well as incrementally valid input to existing job matching processes and algorithms.
(6) Intuitive. Must be suitable for applicants without previous knowledge of the Navy.
(7) Educational. Must expand the applicant's understanding of available opportunities. Pictorial representation can convey information very effectively in this context.
(8) Honest. Must provide an accurate portrayal of opportunities available in the Navy. Picture selection must portray actual job tasks and environments.
(9) Predictive. Must predict job performance outcomes.

The development of JOIN can be divided into two sections: the development of a taxonomic model that captures the human vocational interest structure in Navy ratings, and the development of the computer-based instrument and items which are linked to the model and comprise the test. In concert with these developmental efforts, JOIN evolved, and the result was rationally validated (i.e., found to be sensible and pragmatic, based on expert users' opinions) and empirically verified in accordance with the above criteria.

Development of the interest structure

To create a knowledge base, the author collected hundreds of pages of authoritative descriptions covering each of the Navy Enlisted ratings. These included, at a minimum, three page descriptions of ratings, created and maintained by the Navy Enlisted Community Managers, containing extensive elucidation of the tasks and duties of each of the ratings. Analyses of these materials, followed by a series of interactive interviews, were performed to create the initial taxonomic interest structure.

The author hypothesized that, similar to taxonomic models of cognitive ability and related tests (Kyllonen, 1995; Kyllonen & Christal, 1989), job interest structure

could be categorized or taxonomized by the work activity an individual is interested in performing (the Process) and the object of that activity (the Content). When combined, these process-content pairings (*P*-C pairs) comprise the Work Activities. Further, while many jobs are similar in nature (for example, Electronics Technician and Aviation Electronics Technician), they are managed as separate ratings. So, while their process-content pairs may be similar or even identical, the work environments differ dramatically (aboard ship, and aboard airplane, respectively, in the above example), and environments are therefore necessary facets for interest structure development. Finally, based on the literature, it was believed that work style preferences (e.g., working in a team versus working independently) is a relevant interest structure variable (Ingerick & Rumsey, 2014) that would not be clearly captured in a taxonomy of only work activities and work environments.

The materials describing the ratings were analyzed for words representing these four domains: Process, Content, Community and Work Style. These words were then collected as summary descriptions for each rating. Process words are verbs (typically transitive) and represent the job activities performed in a rating (e.g., maintain, operate). Content words are the object of the transitive verbs and represent the technical domain area of job activities (e.g., aircraft, mechanical equipment). Community refers to a broad group of ratings that share organizational function or work process (e.g., aviation, submarine, surface, health care) and are typically directly linked to a type of vessel or site. Work Style words capture general and contextual descriptions of the type of work, such as indoor versus outdoor, mental versus physical, and industrial versus office.

The effort resulted in a taxonomy for the approximately 80 ratings, with hundreds of words representing Processes, Contents, Communities and Work Styles. Through a series of iterative interviews with each of the Enlisted Community Managers, the author created a controlled vocabulary (Watson, Hindelang, & Michael, 2002) guided by the principle of parsimony. The resulting interest structure contained 25 Work Activities (i.e., process-content or P-C pairs), 8 Communities and 8 Work Styles (as presented in Watson et al., 2002). The JOIN model of Navy work, is now considered the first successful application of the Watson Interest Taxonomy (WIT) process (Watson and Whiting, 2019).

All Navy ratings were described (mapped) in this taxonomy using these 41 items, first in a spread sheet by hand, and then coded into a software tool (see below). As a practical constraint, process-content pairs were limited to a total of 5 per rating (for example, for the Hospital Corpsman rating within the Health Care community, process-content pairs, or Work Activities, included Analyze Documents, Maintain Documents, Maintain Supplies, Respond to Emergencies, and Serve Customers). Subject matter feedback further indicated successful progress towards developing the taxonomy.

Development of the software instrument

Following efforts to capture the Navy enlisted interest structure, the JOIN computer software instrument was built to reflect that structure, to map taxonomy items to ratings, to measure interest by collecting a strength of preference index for each item in the taxonomy, to compute interest scores, and to provide data to assess scores' potential as a classification tool (Farmer, Watson, Alderton, Michael, & Hindelang, 2006c). Items for the computer program were created and linked to the taxonomy, resulting in 25 Work Activity, 8 Community, and 8 Work Style items. All items presented a label (e.g., Maintain Weapons), a short textual description (e.g., Service and repair small arms, missile systems, and other munitions), and multiple representative images presenting a diversity of actual Navy Sailors performing relevant aspects of the content described in the item. Textual descriptions summarizing the item were in "plain English." While previous JOIN instruments featured identical repeated presentations of each item (Chen & Jones, 2008; Farmer et al., 2006c), those efforts showed excellent reliability among the repeated items, and therefore, the latest JOIN version used a single presentation of each item.

All response formats are presented as radio buttons, and the participant selects from five preference levels: very interested, interested, neutral, somewhat uninterested, or uninterested. For each respondent, an overall JOIN score is automatically computed for each of approximately 80 Navy enlisted ratings. A respondent's JOIN score for a rating is based on the strength of the Sailor's interests for the specific communities, responses to environment/work style items, and responses to process-content pairs associated with that rating. JOIN overall scores range from 0 to 100, with higher scores indicating greater interest in a specific rating.

Design criteria

Using a combination of quantitative and qualitative evidence, we describe how JOIN shows promise in meeting the Navy's needs in accordance with the nine design criteria.

Discriminative

Military classification on the personnel side is the assignment of an individual to an enlisted job and all necessary training. For an instrument to be of use in this process it must be able to provide some type of "goodness of fit" score for each enlisted rating. Ideally, this goodness-of-fit measure is unique for each rating; interest models with multiple orthogonal facets have broader potential to provide unique job descriptions and person-job congruence scores than instruments with a low possible number of combinations of interest profiles (for example, Holland-based models).

For management effectiveness, the Navy strives to merge ratings where there are no substantial differences in the tasks, environments, and styles. This strategy is intended to reduce duplicate ratings and add more education and advancement opportunities for individuals within overlapping ratings. Given a ratings merger policy, it was assumed that an interest measure derived from the actual job structure could help differentiate jobs (ratings), and provide additional information about the uniqueness or overlap of Navy ratings. JOIN "goodness of fit" scores provide fine distinctions for each of the Navy's 80 ratings, with the additional potential to inform Navy policy for rating mergers.

Sustainable

Requirements for the Navy enlisted force structure are not constant. In response to changing technologies and management principles, new ratings are created, existing ratings are merged, and old ratings are discontinued. In consideration of this dynamic, the author believed that, if possible, the structure of job preferences should be driven by job facet related interests, rather than a trait or personality model of human interest. If the rating interest structure could be derived from the activities, styles and environments of the work, and communicated in everyday, common language, perhaps applicants' preferences could be measured. If this were possible, then sustaining JOIN could be as straightforward as performing an interest-based job analysis for new ratings as they were created. In short, if the process for creating the rating interest structure could be validated, then a standardized procedure could be derived, requiring reasonably minimal resources to maintain the instrument's relevance and validity. In addition, feedback from subject matter experts suggested that applicants' interests in jobs could be captured in a sustainable way using the unique description created for ratings.

Parsimonious

It was clear from the onset that building a model which was able to create unique profiles for each Navy rating using the fewest number of descriptors would allow for sustainability, and shorten test taking times. A controlled vocabulary was created iteratively in the interview process to combine words into indexing categories. For example, rather than having multiple words representing a Content (such as pump, valve, engine), the Content was summarized in the single word "mechanical." Again, subject matter expert feedback strongly suggested that the controlled vocabulary resulted in an efficient and effective way to describe interest facets of their ratings. Over the course of the interview processes, it became apparent that SMEs should be limited in the number of process-content pairs allowed to describe their rating. Most of our ratings require work performance across a number of common tasks, which may not importantly distinguish them from other ratings. Therefore, a practical limit of five maximum process-content pairs was set for the interview and subsequent model development.

A thorough assessment of the 25 process-content pairs (Watson et al., 2002), using similarity coefficients (Silverman, 1966), resulted in a reasonably intuitive set of principal components in a military context (for example, Technical Electronic, Technical Mechanical, and Administrative, capturing 22%, 19%, and 14% of the variance, respectively). However, this effort confirmed that the process-content pairs alone did not provide adequate unique discriminability, in that 20 ratings shared the same set of process-content pairs with at least one other rating. Unique rating descriptions existed only with the inclusion of Community and Work Style facets.

Fast

Testing time in military environments is at a premium. For example, in the accessioning process, applicants frequently receive physical exams, test batteries and vocational counseling on the same day. The need to enable the practical addition of a new test in this environment, and to minimize test fatigue, require that the test be not only valid, but as efficient as possible.

While initial tests of the software used three times as many items as we believed would be required (for reliability assessment), the average testing time was less than 60 minutes. Assuming that we could reduce to that extent, twenty minutes was assumed to be reasonable compared to like tests.

Modular

To maximize usefulness, it was desired that the JOIN system be truly modular not only from a technical perspective (usable across a variety of testing platforms), but in that the results could be used as a standalone source of vocational preference, and as an input to the Navy's standardized classification process, the Rating Identification Engine (RIDE). RIDE is the Navy's centralized classification system, which functions as a collection of algorithms that use composites of ASVAB subtests to match applicants to challenging ratings in which they will excel (Watson, 2010; Watson & Blanco, 2004). For the JOIN output to be useful, it must provide a goodness-of-fit index that can readily be provided to and interpreted by RIDE. In short, as JOIN provides unique profiles for each rating, and develops a single profile for an individual, the contrast in profile between the individual and each rating results in a singular, simple rank ordered listing representing goodness of fit, which can be readily used as a standalone measure or as an input to RIDE or any truly modular system or model.

Intuitive

It was believed that the best instrument would require no assumption of previous knowledge about the Navy. To this end, the JOIN instrument contains single screen items which present the applicant with text describing a single interest concept, and pictures representing a collection of tasks related to that concept. For example, when presented with an item gauging interest in working outdoors, one of the pictures contains an image of an underwater diver. In this way we could clearly communicate the intent of the concept "outdoors" in the Navy context. Images related to these concepts were initially selected by a small group of SMEs, and iteratively refined by multiple workshops where SMEs voted on the alignment of pictures to concepts. A prototype tool was built, and a "real world" test of JOIN was conducted with SMEs. SMEs were asked to provide interest responses that would be expected to place their own ratings at the top of the list of preferred ratings. SMEs were able to produce the expected result in that their rating was indeed in the top three in terms of goodness of fit. Further support of JOIN's intuitive characteristics came from a usability survey, in which 93.7% of a large number of recruits rated JOIN's ease-of-use as good or very good, and 89.9% rated it high on visual appeal (Chen & Jones, 2008).

Educational

Since the design assumed no initial familiarity with Navy ratings, the tool would have to provide exposure to all opportunities available in a way that would aid the respondent's understanding of the concepts, and as such, teach them about aspects of Navy jobs. For example, many applicants may not realize the Navy offers a variety of construction jobs, including construction electrician, builder and heavy equipment operators. To convey this information to the individual, it is key to have a collection of textual descriptions and pictures that realistically represent relevant aspects of the jobs in this area.

Although brief, this realistic job preview should be key in helping individuals assess their own job preferences (Premack & Wanous, 1985). A combination of textual description and carefully selected digital imagery provide an efficient way of communicating Navy job concepts to the applicant (Chen & Jones, 2008; Farmer et al., 2006c). Chen and Jones (2008) reported that over 70% of 5,000 recruits reported a perceived increase of knowledge of ratings due to the usage of the JOIN instrument, and over 85% agreed that the use of pictures along with text was more informative than text alone.

Honest

The instrument will have an impact on the anticipation the individual has for the training, job tasks and environments associated with their jobs. Since our goal is job performance success, this tool is likely to be most effective if texts and pictures honestly depict a diversity of tasks and environments, regardless of how desirable they may initially appear. The Navy functions under some fairly adverse conditions, and to not present these would set false expectations (likely leading to poor performance), and reduce the apparent credibility of the instrument to applicants. Subject matter expert interviews suggested that some process-content pairs (i.e., Work Activities) would have very low or nonexistent interest, although results by Farmer et al. (2006c) indicated that all Work Activity statements recorded some reasonable level of interest across participants.

Predictive

For our purposes, a useful instrument must be able to reliably predict success in key job performance metrics. Three major performance metrics are of concern to the Navy: Training success, job performance, and retention. As demonstrated in previous research (including Watson, 2010; Watson & Blanco, 2004; EDS Federal, 2001) the Rating IDentification Engine is a strong predictor of training success, but

has lower predictive power for job performance measures (for example, performance evaluations and promotions) and retention. These findings are consistent with training success being heavily dependent on aptitude fit, whereas sustained job performance becomes more dependent on other factors, such as interest fit, in both civilian (Motowidlo, Borman, & Schmit, 1997) and military (Campbell & Knapp, 2001) contexts. Data on the predictive validity of JOIN are examined in the next section.

Psychometric analyses

Besides research addressing the design criteria above, additional research was conducted to assess JOIN's descriptive data and psychometric properties. The results from this research are presented below. Because of the importance of the last design criterion, the predictive validity of JOIN, separate results pertaining to it are presented following these more traditional psychometric analyses.

Sample

The research reported here is based on a data set of 6,988 U.S. Navy enlisted personnel (incumbents). These individuals were at various stages of their career who voluntarily took JOIN between the years of 2009 and 2013, but for whom JOIN scores had not been used to assign jobs. This data set represents all JOIN takers currently available in our personnel systems from that time period with valid JOIN test scores (240 records were not used due to 0 variation in responses to Work Activity items). In this sample, 77.6% (5,421) were male and 22.4% (1,567) were female compared to 82.3% and 17.7% respectively for the Navy at large. Paygrades ranged from E1 to E6. Average Armed Forces Qualification Test (AFQT) scores for the sample were 63.4 as compared to the Navy average of 62.6 in 2013, and tracked closely with Navy AFQT distributions across the full range of scores (Figure 1).

Average item scores and standard deviations by gender are shown in Table 1. Top Communities of interest for males were Intelligence, Special Warfare and Aviation while females preferred Support, Health Care, and Intelligence. Top Work Styles for males were Outdoor, Independent and Team, while females preferred Independent, Indoor and Office. Top work activities for males were Train People, Operate Weapons, and Maintain Security, while females preferred Train People, Maintain Documents and Analyze Documents.

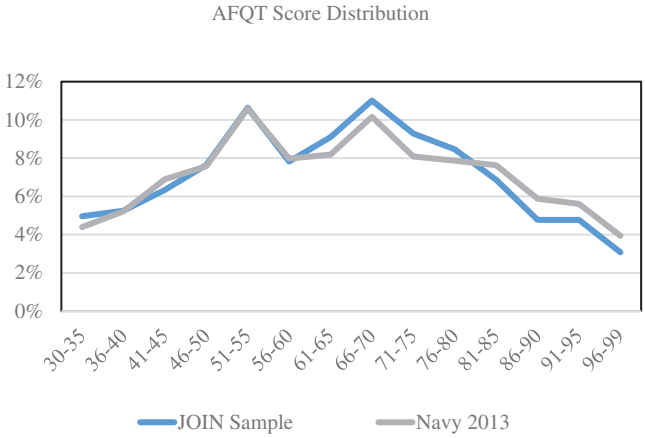

Figure 1. AFQT in sample closely resembles the Navy averages.

Validity analyses

Exploratory work activity scale analysis

An exploratory factor analysis was conducted to determine if the 25 Work Activity items grouped into interpretable, logical dimensions. A principal component analysis with varimax rotation was performed. Six Work Activity factors were extracted and easily interpretable (Hands-On, Administration/Supply, Analysis, Electronic/Electrical, Weapons, and Emergency Response); factor loadings are presented in Table 2. Internal consistency reliability within each of the six dimensions was very good, ranging from .88 for Electronic/Electrical to .80 for Weapons. One other item, Train People, loaded on its own factor. Combined, these factors explained 73.7% of the variance. The interpretable factor structure of the 25 Work Activities suggests a coherent, relatively independent grouping of work types.

Criterion-related validity

To assess the degree to which individual's JOIN scores for their own rating were associated with more positive outcomes, the association between JOIN scores and five Navy criterion variables was examined. As shown in Table 3, participants who attrited during the first enlistment term tended to have lower JOIN scores when compared to those who did not attrite. Participants who desired to stay in their assigned rating and those who reenlisted tended to have higher JOIN scores than those who did not. Sailors who were promoted to E-6 within their first nine years of service also had higher JOIN score means than those who were not promoted. Sailors who successfully completed their initial training with no setbacks (adverse events) tended to have higher JOIN scores than those who did not. Figure 2

Table 1. Average item scores and standard deviations by gender.

	Female		Male			Female		Male	
Communities	Mean	SD	Mean	SD	Work Activity (P-C pair)	Mean	SD	Mean	SD
Aviation	2.49	1.43	**3.02**	1.48	Analyze Communications	**3.05**	1.26	2.92	1.27
Construction	1.97	1.24	**2.92**	1.44	Analyze Data	**3.13**	1.28	3.00	1.28
Health Care	**3.32**	1.49	2.75	1.47	Analyze Documents	**3.52**	1.18	2.86	1.32
Intelligence	3.24	1.38	3.32	1.41	Direct Aircraft	2.30	1.30	**2.44**	1.29
Support	**3.60**	1.37	2.75	1.49	Direct Emergency Response	2.63	1.28	**2.87**	1.27
Special Warfare	2.32	1.38	3.18	1.46	Maintain Documents	**3.57**	1.18	2.67	1.31
Submarine			1.88	1.23	Maintain Electrical Equip.	2.05	1.13	**2.69**	1.28
Surface	2.34	1.29	**2.70**	1.37	Maintain Electronic Equip.	2.24	1.19	**2.80**	1.31
					Maintain Facilities	1.96	1.07	**2.15**	1.16
	Female		Male		Maintain Mechanical Equip.	2.05	1.16	**2.72**	1.32
Work Style	Mean	SD	Mean	SD	Maintain Security	2.59	1.32	**3.23**	1.32
Indoor	**3.89**	1.01	3.40	1.16	Maintain Supplies	**2.55**	1.26	2.27	1.20
Outdoor	3.14	1.32	**3.93**	1.09	Maintain Weapons	2.04	1.19	**2.69**	1.32
Industrial	2.15	1.12	**2.81**	1.22	Make Communications	**2.95**	1.26	2.77	1.22
Office	**3.85**	1.14	3.07	1.33	Make Documents	**3.27**	1.25	2.57	1.31
Mental	3.75	1.02	3.67	1.08	Make Facilities	2.30	1.32	**2.99**	1.39
Physical	3.26	1.17	**3.81**	1.03	Make Mechanical Equip.	1.91	1.12	**2.76**	1.34
Independent	3.95	0.96	3.90	0.95	Operate Electrical Equip.	2.28	1.19	**2.83**	1.24
Team	3.59	1.06	**3.82**	0.97	Operate Electronic Equip.	2.66	1.29	**3.08**	1.27
					Operate Facilities	**2.40**	1.27	2.09	1.18
					Operate Mechanical Equip.	2.17	1.22	**3.09**	1.35
					Operate Weapons	2.71	1.41	**3.74**	1.27
					Respond to Emergencies	2.82	1.33	**3.14**	1.31
					Serve Customers	**3.25**	1.38	2.46	1.36
					Train People	3.77	1.10	3.76	1.09

Note. Gender differences between item responses were assessed using independent samples t-tests, with the critical *p* value set to .001 using the Bonferroni correction to adjust for multiple tests. Significantly larger score bolded. Females were not shown submarine items as they were not eligible for submarine duty in 2013.

Table 2. Factor loadings and reliability estimates of work activities.

Scale	α	Variance Explained	Work Activity	Factor Loading
Hands-On	0.85	30.1%	Direct Aircraft	0.32
			Maintain Facilities	0.48
			Maintain Mechanical Equipment	0.71
			Make Facilities	0.71
			Make Mechanical Equipment	0.77
			Operate Mechanical Equipment	0.78
Admin/Supply	0.85	18.5%	Maintain Documents	0.68
			Maintain Supplies	0.69
			Make Documents	0.64
			Operate Facilities	0.71
			Serve Customers	0.76
Analysis	0.85	8.3%	Analyze Communications	0.75
			Analyze Data	0.77
			Analyze Documents	0.63
			Make Communications	0.60
Electronic/Electrical	0.88	7.0%	Maintain Electrical Equipment	0.74
			Maintain Electronic Equipment	0.79
			Operate Electrical Equipment	0.64
			Operate Electronic Equipment	0.64
Weapons	0.80	3.6%	Maintain Security	0.63
			Maintain Weapons	0.55
			Operate Weapons	0.78
Emergency Response	0.85	3.3%	Direct Emergency Response	0.75
			Respond to Emergencies	0.81
Train People	n/a	2.9%	Train People	n/a

illustrates the relationship between JOIN score and this set of criterion measures. Correlations were the highest with the reenlistment (r = .175) and promotion criteria (r = .121).

Discriminant validity

In addition to the predictive validity analyses above, we tested the divergent or discriminant validity of the overall JOIN score. In the present study, divergent validity refers to the degree to which JOIN does not relate to other measures that assess conceptually dissimilar constructs (that is, constructs that are less theoretically related to JOIN). We would expect JOIN to be unrelated or very weakly related to two conceptually distinct measures: RIDE (a measure of aptitude fit), and AFQT scores (a measure of General Intelligence). Correlations were **.071** for JOIN and RIDE (r2 = 0.5%), and **−.042** for JOIN and AFQT scores

Table 3. Summary of criterion-related validity findings.

Criterion	N	Condition	Average JOIN Score	Significance
First term attrite	3880	Total		
	3650	No	69.0	
	230	Yes	62.6	
		Difference	-6.4	t (257) = 6.20, p < 0.001
Desired to stay in same rating at reenlistment	5474	Total		
	99	No	56.0	
	5375	Yes	69.1	
		Difference	13.1	t (101) = 7.92, p < 0.001
Successfully reenlisted in Navy	3862	Total		
	576	No	62.3	
	3286	Yes	69.7	
		Difference	7.4	t (794) = 11.14, p < 0.001
Promoted to E-6 by nine years of service	1993	Total		
	1374	No	70.4	
	619	Yes	74.2	
		Difference	3.8	t (1240) = 5.52, p < 0.001
Passed initial training with no setbacks	1003	Total		
	136	No	60.9	
	867	Yes	65.7	
		Difference	4.8	t (168) = 3.05, p = 0.003

Note. Sample size varies for these analysis because all respondents did not reach the necessary time period to experience every career event .

Figure 2. Relationship between average JOIN score and criterion variables.

(r2 = 0.2%), both very low correlations and certainly much lower than the predictive validity correlations presented above.

Discussion

Job Opportunities in the Navy (JOIN) is a test of human vocational interest that captures the way people think about and communicate their interests in Navy jobs. This new approach to vocational interest modeling is distinct from traditional approaches, focusing instead on developing a model of vocational interests which can be taxonomized and measured rather than focusing on broad personality traits derived from testing materials. The military has a keen interest in using vocational interest measurement to improve the classification process, but has not supported sustained use of previous interest measures as they do not meet a number of performance criteria.

Quantitative and qualitative/descriptive results in this paper suggest that the JOIN instrument shows promise in meeting nine design criteria. Using actual job materials and formative research with subject matter experts and research participants, we were successfully able to build a parsimonious JOIN taxonomy that captures the structure of Navy jobs and develop easy-to-use software to present and measure that taxonomy. This taxonomy is discriminative, in that it differentiates preferences for Navy ratings by providing "goodness of fit" scores for each enlisted rating for every applicant. To the degree that two ratings are similar in terms of their work and context, they may be equally desirable; however, we believe that the discriminability of JOIN's taxonomy is adequate for classification, and can provide information about the uniqueness or overlap of Navy ratings for rating-merger decisions. JOIN is also fast in that it requires only approximately 13 minutes (Watson, 2015). JOIN appears to be sustainable. For example, in 2006, ratings (Lithographer's Mate, Journalist Photographer's Mate, and Illustrator Draftsmen) were combined to create the Mass Communications Specialist Rating (Held, 2016). Creating the JOIN profile (Community, Work Style/Environment, and Work Activities) for this new rating required only subject matter expert interviews. This effort did not add time to implementation of the new rating. With regard to modular design, JOIN can be readily used as a standalone measure or as an input to existing cognitive job matching processes and algorithms (e.g., RIDE).

JOIN appears to be Intuitive and Educational, meaning it is easy to use among applicants without previous knowledge of the Navy, and expands their understanding of available job opportunities. Chen and Jones (2008) reported that over 70% of 5,000 recruits reported a perceived increase of knowledge of ratings due to the usage of the JOIN instrument, over 85% agreed that the use of pictures along with text was more informative than text alone, 94% found JOIN to be easy to use, and 90% rated it high on visual appeal. Although JOIN has value as an education tool for teaching about Navy jobs opportunities, our results show applicants' interests align with traditional gender roles (although Train People was the top work activity for both genders). More Navy jobs are now open to women than when the present data were collected, including jobs in the submarine Community. The Navy is actively recruiting women for non-traditional jobs, from Electronic Technicians on a Nuclear Air Craft Carrier or Submarine to Aviation Structural Mechanics (https://www.navy.com/navy-life/winr.html). It will be important to track any changes in interests by gender as a result to these efforts.

An additional design criterion is that job previews should be honest and accurate. JOIN's digital images are intended to present desirable as well as potentially undesirable aspects of jobs. Data from the present study showed the lowest interest for females in Make Mechanical Equipment, and for males in Operate Facilities, with average responses equating to "Somewhat Not Interested." It appears that while some JOIN Work Activities receive fairly low average interest measures, an appreciable number of Sailors do endorse these Work Activities (Farmer et al., 2006c). Moreover, the variability in interest to ratings supports the idea of realistic presentation of Navy ratings. A final design criteria, Predictive, is among the most important in establishing the validity of the instrument. Data presented here show JOIN scores are significantly (albeit modestly) related to five Navy outcomes, from first term attrition to reenlistment to promotion to E-6 after 9 years. This area will continue to be developed using stronger research designs and samples, although at this point, results are promising. In addition to predictive validity, the analyses presented here support JOIN's factorial validity and discriminant validity.

It is important to note that JOIN participation was voluntary at the time of this study. Navy leadership has directed that JOIN will be used for all accessions beginning in October 2018, and be established as an official Program of Record. Additionally, the United States Air Force has constructed an interest test based on JOIN features, including model structure and scoring algorithm. As the Navy enacts policy to make JOIN mandatory for all personnel involved in a classification process (e.g., recruiting initial classification, training failure reclassification, re-enlistment related reclassification) more representative and larger samples will be available in the future, which may strengthen the evidence for JOIN's utility and predictive validity. JOIN's usefulness will be truly tested for Navy applicants in the high stakes initial selection and classification decision process.

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