

Navy Interest Inventory: Approach Development

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Foreword

A few words about the authorship of this report: this report was a group effort. The authors worked interdependently making equal contributions. Since there was no obvious way to arrange authorship, Human Resources Research Organization (HumRRO) authors were listed first as a group, followed by our outside experts, Drs. William E. Alley, Lenore W. Harmon, and James Rounds, who were listed in alphabetical order.

David L. Alderton, Ph.D.
Director

Executive Summary

The report that follows serves two purposes. First, it provides Navy Personnel Research, Studies, and Technology (NPRST) with background information on the relevant considerations for developing a Navy interest inventory, which will meet its requirement to improve the matching of recruits to ratings as a primary means of reducing first term attrition. Second, it presents a project plan to develop and validate such a Navy interest inventory.

To accomplish these two goals, we began by meeting with NPRST management and research staff to learn about the Navy's needs for interest measurement and how an interest inventory would be used in the recruiting, selection, and classification system. In addition, we explored the range of impacts a properly designed instrument could have on improving the effectiveness and efficiency of Navy manpower, personnel, and training operations.

The outcome of this meeting was a guiding perspective for our review and for designing a project plan to create and/or validate a Navy interest inventory. The two main factors we used to guide the process that led to this report are the following:

1. The Navy interest inventory should be designed to measure vocational interests that reflect the specific work of Navy ratings and the unique aspects of the Navy's work environment.
2. The Navy interest inventory should be designed for use in the Navy's enlisted personnel classification system, which is presently operationalized as Classification and Assignment within PRIDE (CLASP), a sequential recruit-rating matching algorithm within the Navy's accession reservation system, the Personalized Reservation for Immediate and Delayed Enlistment (PRIDE). NPRST has developed new decision support software called the Rating Identification Engine (RIDE). The Navy interest inventory must be designed for use in RIDE. This requires three design considerations.
 - a. The inventory must discriminate among ratings for the purpose of person-job matching. (Note that although Navy recruits are assigned to specific ratings, the nature of the occupational structure of the ratings probably will mean that the interest inventory will be created to differentiate occupational interest-based clusters.)
 - b. The scoring procedure must be appropriate for use in the classification algorithm.

- c. The inventory must add to the predictive effectiveness of the Navy's classification system. Based on our conversation with NPRST staff members, we decided that the best use of the interest inventory would be to predict first-term attrition (probably through job satisfaction and possibly satisfaction with the Navy as a whole). Attrition is not predicted by the Armed Services Vocational Aptitude Battery (ASVAB), which is for the most part a measure of general cognitive ability.

Previous research by the Army and Air Force suggests that an interest inventory may add incremental and differential (in the classification sense) validity to the ASVAB by improving the prediction of technical training achievement and on-the-job performance. However, the developmental goal of the Navy interest inventory project should be to address the absence of good measures of attrition, with secondary consideration given to training achievement and job performance, if feasible.

To evaluate their relevance for use by the Navy and to generate a set of strategies for designing and validating an effective Navy instrument, we reviewed 22 interest inventories. Twelve of the instruments constituted a representative sample of the most prominent inventories developed for private sector applications (primarily vocational counseling). Two instruments, the Interest Finder and Interest Profiler, were developed for civilian public sector use. The Interest Profiler was designed as a component of the Department of Labor's (DOL) battery of vocational assessment instruments. The Interest Finder was developed to enhance the vocational assessment capability of the Department of Defense's (DOD) student testing program.

The remaining eight instruments are interest inventories and quasi-interest inventories that were developed for the Navy, Air Force, and Army. These instruments were carefully designed by leaders in the fields of vocational interests and general psychological measurement. Their validation histories vary widely in terms of both the types of studies conducted and the types of criteria examined, as do those of the other 14 inventories. Despite the quality of the military interest inventories, and the attempts to validate them, none of the instruments have made their way to implementation. We believe that NPRST managers must be cognizant of the history of interest inventory development in the Armed Forces. We recommend that they use this information, in combination with an understanding of the current Navy and overall military enlisted personnel assessment environment, to design a plan for developing, validating, and implementing a Navy interest inventory that will be used operationally for the first time.

The main conclusion we derived from evaluating the 22 instruments was that none of the inventories, including those previously developed for the Navy (Navy Vocational Interest Inventory [NVII]; Civilian-Military Interest Survey [C-MIS]; and Navy Vocational Interest System [NVIS]), met all three design criteria listed above. Consequently, we recommend that NPRST develop a new instrument that will meet its present requirement. However, the existing Navy instruments did provide a well-tested item pool and valuable information on basic Navy interest and occupational scales. The development process, therefore, should make use of the item pools and scales of the previous Navy interest inventories, as well as those instruments developed by the Air Force and Army.

Further, we recommend the basic interest scales of the instrument be measured by “work activity statements.” Applicants or recruits would rate each statement using Likert-type scales to indicate the extent to which he or she likes or dislikes the activity. The work activity items can be developed through an abridged job analysis procedure and refined through a traditional interest inventory development method. In addition to work activity statements, work environment (i.e., preferences for working indoors, working out-of-doors, working in confined spaces, etc.) and work style (i.e., preferences for working under pressure, working alone, determining the work of others, etc.) items should be tested for inclusion in the instrument to maximize its potential for predicting first term attrition.

The project plan includes both concurrent and predictive validation studies in which the main criteria are satisfaction with rating and with the Navy, and attrition within the first enlistment term. It also includes an operational evaluation that compares classification through RIDE with and without an interest function based on the inventory.¹ The predictive validation and operational evaluation studies must be longitudinal to capture first term retention. We estimated the timeline for the entire effort to be five to six years.

¹ Since the interest function in RIDE will be an important determinant of its utility, we recommend that the process for developing RIDE include input from the interest inventory development team.

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Introduction

This report presents the conclusions of a project undertaken for the Navy Personnel Research, Studies, and Technology Division (NPRST), Bureau of Naval Personnel, which is revising the Navy's classification algorithm for enlisted personnel. The developmental goal of the proposed new classification decision support software (DSS), the Rating Identification Engine (RIDE), is to improve the recruit-rating assignment process so that it provides greater utility in the operational classification system. The operational system is implemented by the accession reservation software called Personalized Reservation for Immediate and Delayed Enlistment (PRIDE). One of the strategies for improving assignments with RIDE is to use a better measure of Navy specific interests than is in the current classification algorithm, Classification and Assignment within PRIDE (CLASP). Currently, CLASP has an interest function based on a crude indicator of occupational preference. The measure consists of a recruit's ranking of his or her 5 preferred Navy occupations out of a total of 15. This indicator of recruit occupational preference is contrasted with Navy fill priorities in the function. In principle, substituting a well-designed vocational interest inventory for the ranking of occupations will improve substantially the quality of data that is available to the new classification algorithm, RIDE. The inventory should be established as a valid predictor of criteria relevant to classification (e.g., satisfaction and retention) for it to improve the accuracy and effectiveness of assignments.

Another way to improve the utility of the recruit-rating classification process in RIDE is to unbundle the interest-based prediction function from Navy fill priorities. This could be accomplished by creating two independent functions (prediction of retention by interests and Navy fill priorities) that can be manipulated separately to reflect prevailing Navy needs and recruiting conditions.

In addition to improving the utility of classification, we believe that incorporating a sound measure of vocational interests in the Navy's classification system could have additional impacts. For instance, a measure of vocational interests has potential as a recruiting tool, in part because its use will provide an applicant with valuable self-knowledge he or she may not be able to obtain elsewhere,² and in part because no other prospective employers (including the other Armed Services) have vocational interest measurement in place in their selection or classification systems. Further, the information provided by the interest inventory could support career development planning and decision-making throughout an enlisted person's naval career.

For the Navy to incorporate interest measurement in its classification system, an appropriate interest inventory must be acquired or developed, and its contribution to Navy personnel and training objectives must be evaluated. This report addresses those requirements. The first purpose of the project was to explore existing interest inventories and to assess their suitability for use in Navy classification. We reviewed a representative sample of prominent interest inventories, including those used by or developed for the federal government and the military services. The objective of the

² This potential benefit was proposed by NPRST staff during the planning session for this project and is supported by the vocational counseling literature.

review was to evaluate whether an existing interest inventory could be employed directly or adapted by the Navy to improve classification. The second project goal was to design a plan for developing and/or validating an interest inventory tailored to meet the Navy's requirement to improve the prediction of job satisfaction and retention.

The organization of the report is consistent with the project purposes. The report consists of three sections and an appendix. This introduction constitutes Section 1. Section 2 summarizes evaluations of extant interest inventories by three highly qualified experts who participated in the project; their detailed reviews of 22 inventories are contained in the Appendix. Section 3 contains the project plan and timeline we designed for developing and validating a Navy interest inventory.

Overview of Interest Measurement Theory and Research

Central to interest measurement is Parsons' (1909) core assumption of matching people and jobs. The matching model as applied in interest measurement is based on the ideas that: (1) interests can be reliably measured, and they are stable over time, (2) occupations tend to be composed of people with similar interests, and (3) a person who has similar interests to other workers in the occupation is likely to be satisfied and to remain in the occupation. The matching model is a central tenet in Holland's (1997) influential vocational interest model.

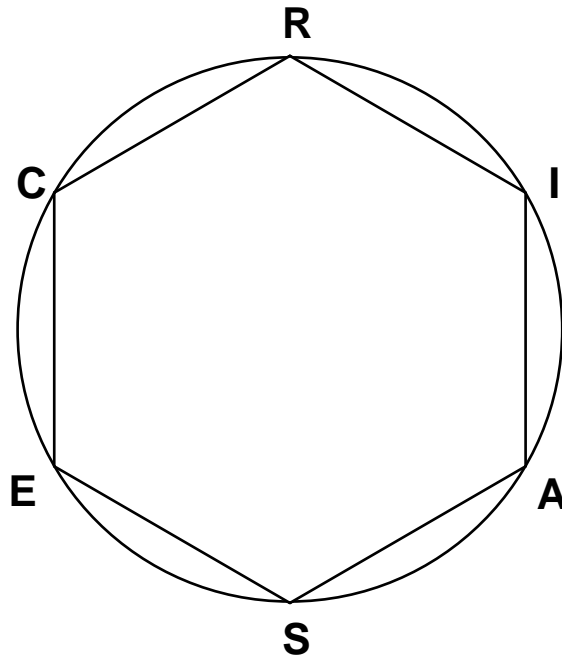
Our evaluation of interest inventories for Navy enlisted personnel classification led us to conclude that the Holland model is too broad a framework to make the relatively fine grained discriminations among Navy occupations that are needed to predict job satisfaction and attrition behavior in a military classification context. However, we describe the Holland model below because it provides a general conceptual model of interest measurement and person-occupation matching. This discussion is followed by a description of three approaches to interest scale construction strategies, which includes alternative methods that are more appropriate for the Navy's requirements. We then discuss measurement issues related to gender and ethnic/racial group differences, uses of interest inventories, and the summary of our reviews of extant interest inventories.

Holland's Model of Interest Types and Work Environments

Since the 1970s, John Holland's (1973, 1997) theory of personality types and work environments has dominated the vocational interest field. Holland proposed that there are six interest types and six work environments: realistic (R), investigative (I), artistic (A), social (S), enterprising (E), and conventional (C) referred to collectively as RIASEC. An important concept in Holland's theory is that people and occupations can be described in the same ways—that is, using these six general themes—allowing a matching approach of person and occupation.

Holland uses a 2-dimensional model to represent the relations among interest types and work environments. His theory postulates that the six types are related to each other in a circular fashion, as shown in Figure 1. The RIASEC arrangement reflects the

closeness of the conceptual relationships among the types. For example, on Holland's circle (also called a hexagon), the A interest type is opposite the C type, indicating that these types have little in common. On the other hand, A and I and S types appear next to each other, indicating shared qualities.



Note: R = Realistic; I = Investigative; A = Artistic; S = Social;
E = Enterprising; C = Conventional

Figure 1. Graphic Representation of Holland's Interest Model.

Holland (1996, p. 398) describes the person-oriented interest types in the following way:

- *Realistic* is “practical, conservative, and having manual and mechanical skills—lacking social skills”
- *Investigative* is “analytical, intelligent, skeptical and having academic talent—lacking interpersonal skills”
- *Artistic* is “open to experience, innovative, intellectual—lacking clerical or office skills”
- *Social* is “empathic, patient, and having interpersonal skills—lacking mechanical ability”
- *Enterprising* is “having sales and persuasive ability—lacking scientific ability”
- *Conventional* is “having technical skills in business or production—lacking artistic competencies”

There is a work environment type corresponding to each of the six RIASEC interest types. Holland (1996) has listed sample occupations in R environments as “carpenter, mechanic,” in I environments as “chemist, biologists,” in A environments as “musician, interior designer,” in S environments as “teacher, social worker,” in E environments as “lawyer, store manager,” and in C environments as “accountant, clerk.”

According to Holland’s parallel typologies, the match between an individual’s interest type and the work type predicts whether the person will be satisfied with the job, whether his or her work will be satisfactory, and how long the person will stay with the job. For example, the model specifies that a person with an S personality is most congruent in an S environment and least congruent in an R environment. Intermediate matches on the hexagon, such as an S person in an E environment, imply a moderate level of fit.

As documented by Borgen (1986), the impact of Holland’s proposal has had far reaching effects on vocational interest assessment. With the merger of Holland’s and Strong’s systems (Campbell & Holland, 1972), for example, the Strong Interest Inventory (Hansen & Campbell, 1985) has scales to assess the RIASEC types and uses Holland’s model to organize assessment results and interpretations. New interest inventories such as the Career Decision-Making Interest Survey (Harrington & O’Shea, 1993) and Career Assessment Inventory (Johansson, 1986) are based on Holland’s RIASEC model. Major vocational assessment programs, including the American College Testing Program (Swaney, 1995) and United States Employment Service’s program (U.S. Department of Labor, 1979) have either explicit scales to assess RIASEC types or methods to convert their interest scale scores to Holland’s system. Gottfredson and Holland (1996) have given the 12,000 plus occupations in the Dictionary of Occupational Titles (DOT) RIASEC codes. With such widespread acceptance of Holland’s RIASEC model in the United States, it is not surprising that researchers and practitioners have adopted his model and measures internationally (Rounds & Tracey, 1996). In sum, the RIASEC typology is grounded in a rich and extensive research history, is widely accepted and used by counselors, and is well received by clients.

Interest Scale Construction Strategies

Over the last 70 years of interest measurement, there have been three major methods of scale development, or three strategies employed in the development of interest scales (see Burisch, 1984). They are the external approach (also referred to as the empirical or contrast groups approaches), the internal approach (also called homogeneous scaling or the inductive approach), and the rational approach (also called deductive or theoretical). A good example of all three of these approaches can be found in the Strong Interest Inventory (SII; Harmon, Hansen, Borgen, & Hammer, 1994). The SII has Occupational scales, Basic Interest scales and General Occupational Theme scales that were developed using the external, internal, and rational approaches, respectively.

The external approach to interest measurement is based on the belief that people can be sorted into groups: for instance, plumbers, social workers, artists and so on. This strategy involves contrasting the item response rates of an occupational sample with the

item response rates of a general group. For example, items are keyed according to how well they discriminate between an occupational group (e.g., truck driver) and a group of adult workers. A major advantage of the external approach is that the scales are very efficient for predicting membership in specific occupations. Another advantage is that these scales are difficult to fake or to respond in such a way as to deliberately influence the scale scores. A disadvantage is that the scales are costly to develop in the civilian sector, because of the need to locate and measure numerous members of each focal occupational group. Finally, these scales are usually longer (have more items) than scales developed using the other approaches, and thus take longer to administer.

The internal approach to measuring vocational interests is based on the idea that there is some basic structure of the vocational interest domain that can be represented by independent dimensions. This strategy involves developing a large number of interest items and having a large group of people respond to the items. Then, a structural analysis of the item response data, such as factor analysis, is performed to identify the underlying independent dimensions of vocational interest. For example, the Basic Interest scales (e.g., Sales, Teaching, Mathematics, Writing) of the Strong were initially developed by clustering the item responses. A major advantage of the internal approach is that the meaning of the scale scores is easy to communicate to clients. Usually, the label of the scale (e.g., Outdoors, Food Service, Electronics) indicates the content and definition of the scale. Furthermore, since the scales are relatively independent, they can be used in a regression analysis to predict occupational membership. The development of the scales can be costly, but once the scales are identified a rational approach can be used to write items for the scales.

The rational approach to interest measurement is based on the idea that the choice and definition of constructs (scales) precede the development of items. This strategy involves developing a theory or model of vocational interests prior to selecting or writing items to measure the concepts in the interest model. For example, the General Occupational Theme scales of the Strong were developed based on Holland's six interest types. Items were identified in the Strong or were written to measure the RIASEC types. The rational approach is the most economical, both in terms of cost of scale development and administration time. Rational scales usually have the benefit of theory, which provides meaning to the scales and leads to wider interpretations of scale scores. The disadvantage is that usually the scale scores are linked to clusters of two or more occupations, not allowing predictions of specific occupational membership.

Is one of these three strategies for vocational interest scale construction best or more valid than the others? The answer is no. Studies of the three strategies show that they produce equally valid scales (Burisch, 1984). Preference for one or more of the scale construction strategies is based on other criteria such as assessment goals, economy, and communicability.

One of the main conclusions of our evaluation of interest measurement for Navy ratings was that a blend of the external and internal approaches to interest scale construction would be most appropriate to differentiate the Navy's occupational groups and to predict satisfaction and attrition.

Gender and Ethnic/Racial Group Differences

It has been known for many years that males and females respond to interest inventory items in different ways (Strong, 1943). For example, many more men than women say that they would like to “operate machinery,” and many more women than men say they would like to “manage a child care center.” When items with sex differences are used for vocational interest inventory scales, the resulting scale scores can suggest career options that are restricted to sex-stereotypic male and female careers.

A significant problem confronting interest inventory developers and users is how to work with the sex-differences that do occur without restricting the choices of any one individual. In developing interest inventories, two approaches have emerged to minimize sex-differences. One approach is to use items that show similar distributions of “Like” and “Dislike” responses for men and women. A second approach is to use norms. The norms can be either same-sex or combined-sex. The former approach—sex balanced items—is used to construct most vocational interest inventories. The latter approach—use of norms—has led to a lively controversy in the literature focused on Holland’s use of raw scores in the Self-Directed Search (e.g., Prediger & Hanson, 1978).

Interest inventories commonly used in the U.S. were developed and validated with samples of primarily middle-class students and workers of European ancestry. A question naturally arises whether or not these interest inventories are appropriate for members of racial/ethnic groups that may have different cultural backgrounds. Whether interest inventories may be less valid for various racial/ethnic groups has been investigated extensively. Swaney (1995; also see Day & Rounds, 1998) conducted the most comprehensive analyses. He studied the appropriateness of the Unisex Edition of the American College Testing (ACT) Interest Inventory (UNIACT) developed for racial/ethnic minority groups (African Americans, Mexican Americans, Asian Americans, and Native Americans) with a national sample of 49,450 students. The minority groups were similar to European Americans in terms of scale reliability, validity, and structure. Reviews of the literature (e.g., Carter & Swanson, 1990; Walsh & Holland, 1992) have generally concluded that interest inventories are appropriate for use with ethnic/racial minority groups.

Uses of Interest Inventories

Interest inventories can be used for a variety of purposes, and serve two important functions. First, inventories provide people with information about themselves and the world of work. Second, inventories can provide the same information for people who make decisions about others such as teachers and personnel managers. The most common use of interest inventories is to aid students making educational and career decisions. The inventory results can start a process of exploration or can be used to narrow choices. Sometimes the inventory information can reassure an individual that has already made an occupational choice. A second use of interest inventories is as selection or placement instruments. It is usually recommended that the inventory is most effective when used within a general screening process. When used in placement,

it is best for the inventory results to be discussed with the person who is being placed so that other aspects of the decision can be taken into consideration. These applications do not exhaust the possibilities.

Reviews of Extant Interest Inventories

Dozens, if not hundreds, of vocational interest inventories have been developed over the years. These vary widely in sophistication, extent of use, and psychometric quality. For the present purposes, a review of all extant interest inventories was not practical. Instead, a selective sample of U.S. civilian interest inventories was reviewed, along with all of the known interest inventories developed for use in the U.S. Armed Services.

In all, 22 interest inventories or quasi interest inventories were reviewed, 14 from commercial publishers and 8 that were developed for military purposes. We reviewed all of the major inventories except some commercial publications that were clearly less desirable than those we had already decided to review. Only 2 or 3 inventories fell into the latter category. The inventories reviewed are listed in Table 1. The reviews themselves are listed in their entirety in Appendix A.

Table 1
Interest Inventories

Military Interest Inventories		User
VOICE	Vocational Interest Career Examination	Air Force
ACI	Army Classification Inventory	Army
AVOICE	Army Vocational Interest Career Examination	Army
C-MIS	Civilian-Military Interest Survey	Navy
I-F	Interest Finder	DOD
JOB Scale	Job Orientation Bank	Air Force
NVII	Navy Vocational Interest Inventory	Navy
OIS	Occupational Interest Inventory	Navy
NVIS	Navy Vocational Information System	Navy
Civilian Interest Inventories		Publisher
CAI-Vocational	Career Assessment Inventory (Vocational)	NCS
CAI-Enhanced	Career Assessment Inventory (Enhanced)	NCS
CDM-R	Harrington-O'Shea Career Decision-Making System-Revised	
CISS	Campbell Interest and Skill Survey	NCS
IP	Interest Profiler	DOL
JVIS	Jackson Vocational Interest Survey	Sigma

Table 1
Interest Inventories

KOIS	Kuder Occupational Interest Survey, Form DD	CTB
MVII	Minnesota Vocational Interest Inventory	PsychCorp
OVISS II	Ohio Vocational Interest Survey, 2 nd Edition	PsychCorp
SDS	Self-Directed Search	PAAR
SII	Strong Interest Inventory	CPP
UNIACT-R	Unisex Edition of the ACT Interest Inventory Revised	ACT
VPI	Vocational Preference Inventory	PAR

Evaluation Criteria

We began our evaluation of extant interest inventories for possible use by the Navy with the idea that 10 criteria would be desirable in an interest inventory to be used with Navy recruits or recruit applicants. The 10 criteria are presented below.

1. The reading level should be appropriate. We assume that a reading level of 9th grade or less would be appropriate.
2. The response format should be easy to use for the respondent, yet adequate and efficient for purposes of scale construction.
3. The medium of presentation should not preclude the use of electronic strategies, such as administration by computer or perhaps over the Internet.
4. The items should have "face validity," both to the applicants who will respond to them and to Navy staff who will use and interpret the results. That is, the content of the items should seem relevant to Navy ratings on their face. Many inventories were originally designed for individuals considering professional or high level careers. Item pools from these inventories might be successful in differentiating people in Navy ratings but might not seem appropriate to respondents or to Navy managers.
5. The scores reported to applicants and Navy users also should have face validity. It will be inappropriate to report scores for professional level occupations to recruits who are considering skilled and unskilled jobs that do not require post-secondary education for entry.
6. Administration time must be as short as possible, but the number of items must be sufficient to yield satisfactory psychometric properties, including reliability and validity.
7. The construction of the inventory should minimize sex differences in the scores obtained, and the scores reported to individuals should not imply that occupations are gender based. The same considerations apply to racial and ethnic differences, but as noted earlier, ethnic differences are considered to be less problematic in interest measurement than are sex differences.

8. The instrument must be as impervious to coaching and impression management as possible because it is to be used to make personnel decisions. This is more of a concern for the Navy than in vocational guidance settings when an instrument is used completely for counseling purposes in which the outcome gives information, but has no effect on personnel decisions.
9. The most important criterion is that the scores obtained from the inventory can be linked to Navy ratings and to the criteria associated with those ratings that are important to the Navy (possibilities include success in training for a specific rating, satisfaction in a rating, tenure in a rating, and on the job performance in a rating).
10. Of course, the psychometric quality should be high. To be considered for Navy use, the instrument must be based on a well-designed scale construction plan and have good reliability, validity, and norm information.

Evaluation Findings Based on 10 Criteria

All of the inventories we reviewed met some of these criteria, but none were found to satisfy all of them. The following list presents the conclusions we derived from reviewing the 22 instruments.

1. Reading grade level. For the most part the inventories we reviewed had acceptable reading levels.
2. Response formats. The response formats, in general, were easy to use, but two basic types would be unacceptable for a Navy inventory. Several inventories that yield scores for Holland types arrange the items so that the Holland types are defined and the items associated with them are indicated. We consider this format to be a potential problem in an inventory to be used for personnel decisions. Further, several inventories use forced choice formats, which are less than ideal for prediction in an employment setting because the scores are difficult to interpret and analyze.
3. Medium of administration. Many of the inventories had both paper and pencil and electronic versions. In general, the translation from paper and pencil to computerized presentations does not appear to present problems in interest measurement.
4. Item face validity. The majority of the items for many of the inventories we reviewed appeared to be related to high level occupations, which is not appropriate for the Navy's mainly non-professional work.
5. Scale face validity. In many of the inventories reviewed, the majority of the scales developed, and consequently the scores reported to respondents, were for a higher level of occupations than represented by Navy ratings
6. Administration time. Many of the instruments reviewed had several hundred items and require up to 45 minutes to complete.

7. Sex differences. Several instruments used item pools that were designed to minimize sex differences. Many of the instruments had separate scales for each sex. Others used raw scores that produce sex differences.
8. Susceptibility to deliberate distortion. As already noted, some instruments are relatively transparent, especially those designed to produce scores related to Holland's typology.
9. Linking interests to Navy enlisted ratings. Few inventories can be linked to Navy ratings in any meaningful way. Those based on Holland's typology can be linked to the Holland codes of the ratings, but Holland codes probably would not provide the level of differentiation needed to differentiate Navy ratings.
10. Psychometric quality. Most inventories were of adequate psychometric quality, although a few problem areas were noted. For instance, many instruments do not have predictive validity data useful for selection and classification contexts.

Summary Conclusions

Of the 22 inventories reviewed, four were deemed to be the most nearly suitable for use in Navy enlisted personnel classification based on the 10 criteria we developed. In alphabetical order, these were: (1) the CAI-Vocational, (2) the NVII, (3) the UNIACT-R, and (4) the VOICE.

Table 2 shows the status of the 4 best inventories in terms of the 10 criteria. Our conclusion is that no single instrument is completely adequate for the task at hand, although all four are very well constructed inventories (as are others that do not appear in the table because they had greater problems for this application). Two instruments, the NVII and the VOICE, have reading levels that may be too high. One inventory, the NVII, has an undesirable ipsative response format. Two instruments, the NVII and the UNIACT-R, are probably too long (or longer than necessary). One, the VOICE, presents no evidence that the issue of gender differences has been addressed. Only one instrument, the NVII, has any validity evidence linking scores to Navy ratings.

Our principal conclusion was that the best approach to measuring the interests of Navy recruits is to develop a new inventory using as many items as possible from the inventories that were designed for the military services. (The non-military inventories are protected by copyright laws.) Using the military inventories to create an item pool will reduce somewhat instrument development time and resources.

Further, we concluded that previous research with interest inventories in the other military services suggests there is reason to be optimistic about the usefulness of a Navy interest inventory for predicting a number of outcomes in the careers of enlisted personnel. Included among the predictable outcomes are job satisfaction, retention/tenure, and even job performance.

Although we did not consider any of the inventories appropriate for the Navy's use, our review generated a number of strategies that we believe would be useful in developing a Navy-specific interest inventory that is designed to predict job satisfaction and first term attrition in a selection and classification context. These are discussed in Table 2 along with desirable features of the inventory.

Table 2
Evaluation of the Four Best Inventories Reviewed for this Report

Categories Evaluated	CAI-V	NVII	UNIACT-R	VOICE
Reading Level	6 th Grade	11–12 th Grade	6–7 th Grade for lower level: unspecified for higher level	11–12 th Grade
Response Format	5-point scale from Like to Dislike	Forced Choice Triads	L-I-D	L-I-D
Medium	Paper-and-pencil/ computer	Paper-and-pencil	Paper-and-pencil/ computer	Paper-and-pencil/ computer
Face Validity–Items	Good	Good	OK, but with some professional level	Good
Face Validity–Scales	Good	Good	Holland-Type	Good
Time to Complete	30 Min	60 Min	Unspecified (90 items)	45–50 Min
Gender Effects	Minimized in construction	A topic of recent research	Minimized in construction	Not assessed
Coaching/Faking Potential	Minimized in construction	Minimized in construction	Not as transparent as some Holland-based measures	Minimized in construction
Linkage to Navy	Not, but could be	Not, but good potential	Cannot distinguish among Navy Realistic ratings	More evidence than other inventories
Psychometric Quality	Excellent	Good, except for item format	Excellent	Excellent

General Strategies for Developing a Navy Specific Interest Inventory

As mentioned above, the first strategy we recommend in developing a Navy interest inventory, which is designed to save some of the time and cost of developing new items, is to use existing inventories developed by the Armed Forces as a source of items for the new inventory. Several of the military instruments contain good item pools (C-MIS, NVII, NVIS, VOICE) that provide excellent sources of items. We recommend that the item pool emphasize work activities that are related to skilled or non-skilled jobs. This type of content has been shown to be superior to other types, such as occupational names. An attempt to select items that reflect the work-related interests of both sexes should be made.

The second strategy for developing a Navy inventory is to use a Likert-type response format employing anchors of like and dislike with three (like, indifferent, dislike) or five choices. Forced choice formats, such as those used in the NVII and MVII, should be avoided because this ipsative technique makes scale construction and interpretation difficult. Negative responses to items should be used in scoring, if possible, to aid in prediction and to make scales less transparent. This would entail using both positive ("Like") and negative ("Dislike") responses in scale score computation, in contrast with the Interest-Finder and the Self-Directed Search, among others, which use only positive responses to compute scores.

The third recommended strategy is to develop interest scales at a level of generality that will maximize prediction of desirable criteria related to Navy ratings (e.g., satisfaction with the job and/or with the Navy). Although they are useful for other purposes, the six Holland scales are almost certainly too broad to achieve this. What is needed is a greater number of scales (each of which represents a more narrowly specified interest area) than in the Holland model, which reflect the full range of diversity of interests that characterize people in the Navy enlisted ratings.

Our fourth development strategy is to design scales that are appropriate for use with either sex. In addition, norms should be based on population samples that include representative proportions of both sexes and all major ethnic groups.

The final strategy we recommend is to consider using some items that are not strictly interest items. Some of the inventories we reviewed had aspects that are worth considering in addition to the measurement of interests. Skills or self-efficacy for occupational tasks might be measured. Response validity scales are desirable for detecting unusual response strategies. Scales that measure preferences for certain aspects of the work environment (e.g., the Clean Hands scale of the NVII) can be constructed from interest item pools. It is also possible to use interest items to develop scales for preferred learning environments.

Desirable Features for the Navy's Interest Inventory and Validation Strategy

There are some drawbacks of existing inventories and validation strategies that ought to be avoided, and some positive features that should be emulated, in the design and development of a new Navy interest inventory. Several of the most important features are highlighted below.

Item content

Items that elicit interests in activities should be preferred over items that elicit interests in specific occupations. "Activities items" have been found to be more useful than "occupations items" for predictive purposes. The content of the activities items (and of any other types of item, as well) should be appropriate to the vocational and technical nature of Navy enlisted job specialties, as opposed to jobs requiring baccalaureate and post-baccalaureate professional education.

Inventory Format

Items measuring different scales should be arranged randomly, rather than placed in separate sections of the inventory, to avoid transparency and thus to minimize susceptibility to response distortion.

Response validity

It is desirable to include in the inventory one or more scales designed to provide indications of dubious or invalid responses to the inventory. The Strong's administrative and validity scales provide a good model for this.

Occupational Structure

Since the inventory will be intended explicitly to aid in assigning enlistment applicants and recruits to Navy ratings, its development should be guided by a sound understanding of the similarities and differences among Navy ratings. To promote this understanding, and to facilitate the intended linkage between scores on the inventory and Navy jobs, a current analysis of the Navy's enlisted occupational structure will be required.

Evidence of Validity

The 22 inventories reviewed for this report differed widely in terms of the amount of available evidence of validity for their intended purposes. In particular, two interest measures developed for Navy use—the NVIS and C-MIS—had little or no evidence of validity; not surprisingly, neither one was put into operational use. To insure the usefulness of the new Navy interest inventory, and to maximize its prospects for operational implementation, rigorous validation studies should be an integral component of the development plan.

Project Plan to Develop and Validate a Navy Interest Inventory

This section of the report presents a project plan to develop and validate an interest inventory that is tailored to fulfill NPRST's requirement to improve the Navy's recruit classification system. The purpose of using interest measurement to improve recruit-rating matching is to predict criteria that are not well measured by the ASVAB—namely satisfaction with the job and with the Navy, and first term attrition. There is some evidence that interests also may provide utility over and above that of the ASVAB in predicting training achievement and job performance. Although the project includes several criteria, it focused on designing an interest inventory geared to improving satisfaction and reducing attrition.

Keeping in mind the Navy's intended use for the interest inventory, we concluded from our evaluations of the 22 interest inventories listed in Table 1 that the type of instrument that would be most effective for the Navy is one that measures basic Navy interests. As we mentioned in Section II under interest scale construction strategies, basic interests are relatively independent, narrowly defined constructs that are related to work activities in a broad range of occupations. Examples of basic interests found in existing inventories that may be relevant to the Navy are electronics, mechanics, writing, record keeping, operating machinery, arithmetic, and communication. Basic interests are appropriate for making relatively fine distinctions among occupations. They may be contrasted with general occupational themes, such as the broadly defined Holland interest types.

We recommend that the Navy's basic interest inventory employ three types of items. The majority of items should be Navy specific work activities derived from a job analysis of ratings and from pre-existing military inventories. Work activities should be more useful than other types of occupational items (e.g., occupation names) for prediction in a classification context. We also recommend that two types of quasi-interest items covering work environments (i.e., preferences for working indoors, working out-of-doors, working in confined spaces, etc.) and work styles (i.e., preferences for working under pressure, working alone, determining the work of others, etc.) be included in the instrument. They will help to insure that the inventory addresses all major aspects of Navy work life that may be related to satisfaction and retention.

The Navy interest inventory development project we describe below consists of seven studies that fall within three broad phases: instrument development, validation, and operational evaluation within RIDE. Like most methods of constructing interest inventories, our project design is a blend of the three development approaches we described in Section II under interest scale construction strategies (i.e., the external, internal, and rational approaches). The research design primarily relies upon a combination of the rational and internal approaches. However, we consider employing an external approach to devise empirically-keyed occupational scales.

The phases and studies of the Navy interest inventory development and validation project are the following.

Phase I: Interest Inventory Development

- Study 1 - Groundwork for a Navy interest inventory;
- Study 2 - Delineating the Navy occupational and interest structures;
- Study 3 - Development of the Navy interest inventory;
- Study 4 - Development of initial Navy occupational clusters;

Phase II: Validation

- Study 5 - Concurrent validity study;
- Study 6 - Predictive validity study;

Phase III: Operational Evaluation within RIDE

- Study 7 - Operational evaluation of the inventory.

The descriptions of the seven studies are presented below, followed by the project timeline. We estimated that the development phase, based on using as much information as possible from existing military instruments, would require approximately 1 1/2 to 2 years. The validation phase would require approximately 2 years due to the need for a longitudinal predictive study of first term retention. The operational evaluation of the instrument as part of RIDE would require about two additional years. It will include a longitudinal examination of retention results with and without using the interest inventory to make classification decisions.

In conclusion, the outcome of the Navy interest inventory development project will be an instrument that:

- Is designed for the Navy's enlisted recruit and/or applicant population;
- Reflects the best theoretical and measurement features of the field;
- Is tailored to the Navy's organizational environment and major work activities;
- Is validated against a range of important criteria, with emphasis on satisfaction and first term attrition; and
- Improves the utility of operational classification decisions over the existing system.

Although a good deal of time is needed for empirical validation, we consider this a crucial investment in the inventory. Previously developed Navy interest inventories, which had little or no validity evidence, have not been put to operational use. Our project design capitalizes on the strengths of these instruments by adapting their scales and items wherever possible. However, we recommend against using any of the instruments in their entirety, because each one has limitations that make it unsuitable for improving recruit-rating assignments. The NVII is not suitable because its forced choice format and scoring procedure produce ipsative scores that are difficult to analyze and interpret. C-MIS is inappropriate because it uses Holland interest types that are too broad for use in the Navy's classification system. The NVIS is not suitable because of the exclusive use of job titles as items and its forced choice format.

Phase I: Interest Inventory Development

Study 1: Groundwork for a Navy Interest Inventory

The successful development, validation, and implementation of a Navy interest inventory will depend largely upon the commitment, cooperation, support and participation of the staff people in Navy organizations responsible for using and maintaining the interest inventory and classification system. Its success will depend even more on the commitment and support of managers and policy makers throughout Navy manpower, personnel, and training operations. We believe that forming constructive working relationships with these stakeholders should be the first step in the project plan, and that maintaining them should be an on-going priority during the course of the project.

We suggest that the development phase begin with a clear statement of goals and objectives. This statement could be formulated by NPRST in conjunction with the contractor, and then presented to the stakeholders along with a description of the proposed interest inventory, its uses, and the project plan. The briefing would serve as the foundation for securing input from NPRST client organizations and Navy decision-makers, and for making any modifications that will improve the instrument and facilitate its implementation.

Meetings should be held at regular intervals and as needed throughout the project, until the inventory is implemented. NPRST, sometimes accompanied by the contractor, can use the meetings to brief clients and decision-makers on the progress, troubleshoot, solve existing problems, and make needed adjustments to the project process. It would be a good idea to have an NPRST staff member assigned to fulfill the liaison function throughout the project.

Study 2: Delineating the Navy Occupational and Interest Structures

The purpose of this study is to identify and define the domain of Navy interest constructs using a joint rational and inductive approach. To map this domain, we must begin by understanding the Navy's ratings, the environments in which Navy work occurs, and the various work styles that are possible. Achieving comprehensive knowledge of the work of Navy enlisted personnel is crucial to developing a Navy specific interest inventory. This knowledge will guide the creation of the instrument's content and insure that it reflects the unique aspects of Navy work life.

Time and resources permitting, a traditional job analysis, which taps current information on the three facets of Navy basic interests (work activities, work environment, and work styles), would produce the most in depth understanding of the Navy's work-related interest domain. A less time consuming and resource intensive approach is one that uses existing rating descriptive material in combination with subject matter expert (SME) tasks. We describe the abbreviated job analysis approach below and believe it is a cost-effective strategy for developing a content outline for the Navy's interest inventory. A content outline consists of the set of interest constructs that are the basis for forming the inventory scales. The inventory is created by developing items, which are refined through a series of studies, to measure each scale.

Data and Subjects. The research team will review all available sources of information that describe work activities and contextual conditions of Navy ratings. Examples include Navy Enlisted Occupational Standards for ratings, the materials used by recruiters and classifiers to describe ratings to applicants, and previous job analysis information, if available. Fifteen to twenty SMEs, who are highly knowledgeable about a broad range of Navy ratings, will be asked to participate in a content validity procedure.

Method. A team of research psychologists will review available job descriptive data and develop lists of work activity and work environment statements that cover all ratings. They also will compile a list of the Navy's current ratings and brief descriptions of them. The two sets of data should be representative of the work currently done in the ratings and should reflect any major changes that are expected in the near-term.

The SMEs will have three tasks. First, they will review and modify the work activity and environment statements to assure content validity and comprehensive coverage of the domains in all ratings. They also will make sure that the work activities and environments reflect important anticipated changes. Second, they will sort the statements into groups that are similar in underlying basic interests. Third, the SMEs will sort Navy ratings, identified by titles and brief descriptions, into groups they perceive to have similar interest profiles.

At least two approaches could be used to structure the SME tasks. One would be to consider each SME as a data point, and have each individual conduct independent sortings that are content analyzed and condensed by the researchers. Another would be to form one or two panels of SMEs to accomplish the sorting tasks. In this case the panel would be the data point. The specific details of the SME procedure are beyond the scope of this report and should be specified at the beginning of Study 2, when the quality of the job descriptive data and the number and experience levels of the SMEs are known.

Work activities and environments. The researchers will conduct a content analysis to identify the basic interest constructs that underlie the groups into which the SMEs sort the work activities and environments. As mentioned above, examples of possible basic Navy interests could be electronics, mechanics, writing, record keeping, operating machinery, arithmetic, and communication. The number and nature of interest areas associated with Navy ratings will be discovered by the researchers through the content analysis.

Rating titles and descriptions. A similar content analysis of the ratings grouped by the SMEs according to perceived similarities in interests will be conducted to identify the underlying interest dimensions. This categorization of ratings will serve two functions in the project. First, it will be a second source of information on the basic interests that underlie the work performed in Navy ratings. As such, the results of this content analysis will supplement those of the work activities and environments, and act as a reliability check. Second, the groups of ratings will be used as a crude occupational interest structure to select a representative sample of ratings for Study 3.

The set of basic interests derived by the researchers from the content analyses of the two sets of SME data will form the core of the content outline. If the military interest inventories summarized in the Appendix include relevant content areas that were not identified in the abbreviated job analysis procedure, they will be added.

In addition, we suggest that the Holland interest types be incorporated into the content outline. We envision a hierarchical model in which the basic interest content areas derived from the job analysis are nested within broadband Holland interest types. For example, basic interests like electronics, mechanics, operating machinery, and outdoors would be nested in the realistic interest type. Although many basic interests clearly will fall within a single Holland type, previous research indicates that some will fall into more than one type.

The use of a hierarchical model can provide flexibility in predictions, if needed, related to the level of generality of the interests. When relatively fine distinctions among occupations are needed, the basic interest areas would be used; when prediction of general occupational themes is needed, the Holland interest types would be used. Another benefit of linking the basic interests to Holland types is that it will provide the opportunity to conduct construct validity research later on, if desired. The C-MIS, NVII, and VOICE all have Holland scales. This also is true of most of the prominent interest inventories in general use today.³

Summary. The approach described in this study is designed to produce a Navy specific basic interest inventory that is content valid. The outcome of Study 1 will be a content outline that identifies the constructs to be assessed by the instrument. The content outline will form the basis in Study 3 for selecting items from previously developed military interest inventories and for developing new items where needed.

Study 3: Development of the Navy Interest Inventory

Development of the Initial Item Pool. Once the overarching interest constructs have been identified and explicated in the content outline, a pool of items to measure these constructs will be created. We believe that a large proportion (perhaps up to 75%) of the items in this initial item pool can be adapted from existing inventories. That is, we expect there to be substantial overlap between the constructs identified in the content outline and those assessed by existing Navy (i.e., C-MIS, NVII, NVIS), Air Force (i.e., VOICE), and Army (i.e., AVOICE, JOB Scale) inventories. We also anticipate some cost and time advantages gained from adapting items from these inventories, since this will alleviate much of the need to create and write items directly. The first step in creating the item pool, therefore, will be to solicit permission from the military personnel laboratories to adapt items for Navy use.

Once permission to use existing items has been granted, a sorting procedure will be employed by the researchers to create provisional scales to represent each of the constructs. At least three researchers will independently complete the sorting procedure. For each item in the item pool, each individual will identify the construct the item most directly assesses. When each individual has completed the procedure, the sortings will be compared. Items that are differentially classified by the researchers will be discussed, and an agreement will be reached as to the most appropriate construct category. Any items for which an agreement cannot be reached will be retained in an unclassified category.

³ Mapping the Holland interest types to the basic interest scales should be a fairly straightforward task because previous research for the Navy has shown that Navy ratings fit within the Holland interest space.

Given that each basic interest scale ultimately will need 10 to 15 items, each provisional scale will require at least 30 items (at least 45 items would be needed if we were not suggesting the use of existing military interest inventories to supply pre-tested items). To fill in holes in content coverage, the researchers will write items for those provisional scales defined by fewer than 30 items after the sorting procedure.

As part of the item development procedure, we recommend conducting an analysis for gender and ethnic/racial insensitivity. This should be done by having the item pool reviewed by experts in interest inventory development. If possible, a preliminary data collection also should be conducted to examine gender differences in item responses. These preliminary subgroup analyses could save valuable time and resources by identifying inappropriate items before the development data collection and analysis have been completed.

The outcome of this part of Study 3 will be a fully developed item pool that has been initially screened for potential gender and racial sensitivity and is organized into provisional basic interest scales tailored to the Navy.

Development of the Navy Interest Inventory. The second part of Study 3 will involve data collection to develop the instrument, which will not be changed substantially in later studies.

Development Samples. We recommend employing two development samples in this research. The first sample, which should be large, will consist of new Navy recruits. These individuals will not be required to have any experience or knowledge of the Navy or Navy ratings. The second sample, which could be relatively small, will consist of incumbents. To obtain an incumbent sample that is mature in their understanding of Navy work life, the incumbents should have worked on the job (after technical training) for at least one to two years.

The benefit of using the two-sample design derives from the differences between naive subjects (recruits) with no Navy experience and knowledgeable subjects (incumbents). Its value is that the items selected for the inventory will reflect the overlap of interest constructs between naive recruits and seasoned naval enlisted personnel. We believe this is an important design feature for a military interest inventory that is designed as a classification tool to predict retention, because the perceptions and interests of enlisted personnel probably change as a result of their naval experiences and the normal maturation process.

Several (perhaps 15 to 20) key ratings will be selected for sampling recruits and incumbents. The ratings will be chosen to represent the preliminary occupational groups, which were identified as representative of the Navy's basic interest profiles by SMEs in Study 2. Again, the samples will consist of recruits newly assigned to the ratings and incumbents currently working in those ratings. In both samples, women will be over-sampled in order to provide sufficient sub-samples to perform analyses by gender.

Method. A provisional paper-and-pencil inventory will be created from the item pool. The items will be placed in random order in the inventory. Participants in both samples will respond to each of the items using a multiple-point rating format. (Since these data will be used for item-level analyses, we suggest using a 5- or 6-point scale in

this assessment, though the researchers may want to consider other alternatives, such as Like–Indifferent–Dislike, for the operational version of the instrument). Participants in both samples also will provide relevant demographic information such as sex, age, race, education level, and rating.

In addition to providing the demographic information and completing the provisional inventory, the incumbent sample will complete brief criterion measures. These measures, which may require a small research effort to construct, will include measures of satisfaction (on the job and in the Navy), propensity to attrit, and desire to re-enlist. We suggest that an objective criterion, A-school first-pass success, be obtained along with ASVAB scores for each individual, if Navy personnel records can be accessed.

Analyses. Four specific sets of analyses will be conducted with these data. The objective of the first set of analyses is to create psychometrically sound scales for each of the constructs identified in the content outline. The data from the recruit sample will be analyzed to identify at least 10 to 15 items for each of the proposed scales. The items to be retained will be identified on the basis of item-level analytic procedures (i.e., examining item interrelations, internal consistency reliability analyses, sex and race differences, and identification of items with restricted ranges of responding).

Analyses based on the incumbent sample will be used to further guide decisions about which items to retain. Specifically, the correlations between the items and the criterion measures (i.e., satisfaction, pipeline success, propensity to attrit, desire to re-enlist) will be examined. Those items found to correlate most highly with the criterion measures will be considered for retention. The result of the item-level analyses will be a rough draft of the interest inventory, which we refer to as the Navy Recruit Assignment Profiler (NRAP).

The second set of analyses will be conducted to evaluate the latent structure of the NRAP. These analyses will allow us to evaluate the correspondence between the structure of the initial instrument with the structure proposed in the content outline. To evaluate this correspondence, a confirmatory factor analysis will be conducted. Based on the correspondence between the factors and constructs identified in the content outline, the researchers may need to consider collapsing or differentiating scales using exploratory factor analysis. Should modifications be deemed necessary, the item level analyses should be used to make revisions to the affected scales.

The third set of analyses will be conducted to evaluate subgroup differences at the scale level. These analyses will provide an indication of the potential for adverse impact. Mean differences for each scale will be evaluated by sex and ethnic/racial group. Additionally, the factor structures of the measure for males and females will be compared (the same analysis will be performed for the ethnic/racial groups if the sample sizes permit). If the sample sizes are large enough, we will examine whether there are subgroup differences in validity coefficients in the incumbent sample. Should these analyses suggest a potential for adverse impact, the item-level analyses can be used to make revisions that mitigate the potential for problems.

The fourth set of analyses will be designed to provide a preliminary assessment of within rating interest profiles. The results will provide an initial evaluation of the extent to which self-selection into ratings based on interest constructs occurs. For those

recruits that already know what rating they will be entering, we can compute mean within-rating scores for each of the scales. Self-selection will be evident if the mean scores within one rating are different from mean scores for other unrelated ratings. If there are no differences in mean scores across ratings, then the researchers can assume that little or no self-selection is occurring.

Additionally, we suggest comparing the mean scores of recruits who will be entering a specific rating with the mean scores of satisfied incumbents already in that rating. This will provide initial, rather rough, information regarding the potential benefits of classification with the NRAP. Specifically, the basic interest scale scores of incumbents who are high on the satisfaction criterion could be compared to the scale scores of all recruits assigned to the same ratings. If the mean scale scores of the satisfied incumbents were different from the scores of new recruits, this would be an indication that the NRAP will probably be effective in classification.

Summary. The outcome of these analyses will be the construction of a psychometrically sound interest inventory we call the NRAP. The results also will highlight the potential for sex and racial differences and provide some preliminary indications of the potential utility of the instrument as a classification tool.

Study 4: Development of Initial Navy Occupational Interest Clusters

The Navy presently uses 15 occupational groups in its classification algorithm, Classification and Assignment within PRIDE (CLASP). Recruits are asked to rank their top five occupational preferences. This ranking contributes to one of six functions that, in combination, determine the choice of ratings presented to a recruit by the classifier at the MEPS. Although we have not formally evaluated the existing occupational groups, our cursory examination suggests that at least some of the occupations may not be homogeneous in terms of interest profiles related to the work activities and work environments of the ratings.

Since the categorization of ratings into interest-based clusters is central to the development and validation of the interest inventory, Study 4 is designed to evaluate the existing Navy occupational groups and to develop a preliminary reclassification of Navy ratings, if necessary. The interest-based cluster structure of ratings we recommend will serve two purposes. First, it will reduce the complexity of measuring interests by aggregating ratings with similar basic interests into a single occupational group. The body of interest measurement literature provides strong support for clustering jobs into interest-based groups, which can range from broad Holland types to more narrow content-based occupational areas equivalent to those we suggest for the Navy. Second, the Navy occupational interest clusters will provide a structure for sampling in later studies that produces adequate within cluster sample sizes.

Analyses. The data from Studies 2 and 3 will be used to form a preliminary set of occupational interest groups, which will be cross-validated in Study 5. A multi-step cluster development and validation method developed by Lightfoot, Diaz, and Vladimirovsky (1997) is recommended because it is one of the few techniques that produces internally validated clusters. The Lightfoot-Diaz approach can be employed to quantitatively group ratings into homogeneous clusters based on the preliminary rating

interest profiles obtained in Study 3. The method uses the Ward hierarchical clustering algorithm, which is appropriate for this analysis because it minimizes within cluster variance in interest profiles and is robust with a variety of data.

The Lightfoot-Diaz method also includes an external validation technique that should be used to compare the occupational structure produced by the Ward hierarchical cluster analysis with the results of the SME groupings of ratings (made in Study 2). A measure of the congruence of the two cluster structures indicates whether the quantitatively derived clusters obtained in this study are externally validated by the SME ratings. Discrepancies are resolved by a combination of quantitative analysis and SME judgments.

Summary. The occupational interest clusters produced in this study will be used to develop the sampling plans in Studies 5 and 6. Further, the structure will be cross-validated and modified, if necessary, in Study 5.

Phase II: Validation

Usually a predictive validity study is conducted after a concurrent validity study. We believe that the two studies can be performed simultaneously in this project because of the great care taken in Studies 2 through 4 to develop a sound instrument and occupational interest structure. The concurrent validation in Study 5 will produce results first, because it will use available criterion data and will not include a longitudinal analysis of the instrument's effectiveness in predicting satisfaction and attrition. The longitudinal investigation will be the focus of the predictive validation in Study 6.

Study 5: Concurrent Validity Study

The primary purposes of this study will be to evaluate the psychometric properties of the instrument, to cross-validate the occupational interest clusters, and to build empirically-keyed occupational scales.

Validity Sample. The sample for this study will be incumbents who have worked in their ratings from six months to two years prior to participation in the research. The incumbents will be sampled within occupational interest clusters. The cluster-based samples will include adequate data from core or benchmark ratings, and large or critical ratings. Smaller ratings and those that are less critical to the Navy's operations will receive less weight in the sampling procedure, but will be randomly sampled according to size.

Method. All participants will provide demographic information and complete the NRAP. The criterion measures described in Study 3 also will be collected (i.e., Navy satisfaction, rating [job] satisfaction, self-report propensity to attrit, and desire to reenlist). In addition, Navy personnel records will be required to obtain ASVAB scores and first-pass success.

Analyses. Three key sets of analyses should be conducted with these data. First, the psychometric properties and structure of the instrument should be evaluated in the new incumbent sample to insure that they replicate the findings of the previous research. These analyses will include internal consistency reliability analyses and an examination of items for restricted ranges of responding. Confirmatory factor analysis will be conducted to evaluate the latent structure of the instrument. Finally, an assessment of gender and ethnic/racial group differences will be made for each of the scales.

Second, the data will be used to cross-validate the occupational interest clusters formed in Study 4. Assuming that the satisfaction criterion is most important in this concurrent validity study (i.e., improving satisfaction will in turn decrease the propensity to attrite and increase the desire to reenlist), we suggest conducting these analyses on only those individuals reporting job satisfaction. Using these individuals, we will compute mean scores on each of the scales within each rating. The Ward cluster solution, which combines ratings with similar profiles of interest scores, will be generated. The Lightfoot-Diaz method will be employed to compare the cluster solution obtained with these data to the clusters from Study 4. This cross-validation of cluster structures will guide whatever revisions need to be made in the final assignment of ratings to the Navy occupational interest clusters.

Third, empirically-keyed occupational scales will be developed. A within-cluster extreme group design will be employed to develop scales for each of the occupational interest clusters. In particular, satisfied and unsatisfied groups within each occupational interest cluster will be identified (these groups will represent the extremes of the satisfaction continuum)⁴. Next, for a given occupational interest cluster, the responses of the satisfied and unsatisfied groups will be compared for each item in the inventory. Those items found to differentiate the two groups will constitute the occupational scale for that particular occupational interest cluster. The procedure will be repeated for each of the clusters.⁵

The fact that the items that ultimately make up these scales will be determined solely on the basis of empirical results should lead to the inclusion of many subtle items (i.e., items that do not appear to be conceptually related to the occupational interest cluster to which they are assigned). As a result of the subtle items, intentional response distortion should be minimized for these scales.

Ultimately, then, an applicant completing the inventory will receive two sets of scores: 1) a score for each of the content-based interest scales and 2) a score for each empirically-keyed occupational scale.

⁴The other criterion information (i.e., propensity to attrite, desire to reenlist, first pass success) could also be used in the development of the empirically keyed scales, or distinct scales could be created for each of these various criteria.

⁵ Another way to develop empirically-keyed occupational scales is to use a contrast group approach. This method contrasts satisfied enlisted personnel in each occupation, who have remained in the Navy at least two years, with a general group of naval enlisted personnel in all other occupations, who have remained in their ratings and were satisfied. Those items that differentiate these two groups are then assigned to the occupational scale.

Summary. The outcome of this study will be empirically-keyed occupational scales and an initial analysis of the interest inventory's utility for classification based on self-report measures of satisfaction, propensity to attrite, and desire to reenlist. Although we expect these criteria to be highly correlated with attrition behavior, only a predictive validity study can establish the strength of the relationship between interests and attrition. Study 6 will produce this information.

Study 6: Predictive Validity Study

A predictive validation study is needed to assess how the instrument operates among new recruits and to longitudinally validate it against retention. Because we do not expect additional revisions to the measure after Study 3, and in order to save time, we propose to begin the predictive validation study at the same time that the concurrent validation study commences. Note that although we will collect NRAP data on recruits as they enter the Navy in this study, we will not make rating assignment decisions based on their scores.

Validity Sample. The sample will consist of new Navy recruits. We recommend that all recruits who enter the Navy over a period of at least 6 months be tested to obtain adequate sample sizes within occupational interest clusters and sufficient numbers of enlisted personnel who will prematurely leave the Navy.

Method. At entry into the Navy the recruit will complete the NRAP. In addition, ASVAB scores, initial rating assignment, and relevant demographic information will be needed from Navy personnel databases. The researchers should follow the subjects for a period of at least one year (preferably two years) to collect criterion data. The main criteria will be satisfaction and attrition, including early attrition from basic and A-school training, if possible.⁶ We also would like to see data obtained on A-school success (i.e., first pass rate).

Analyses. The main analyses will parallel those performed in the concurrent validation study, but the focus of this study is the longitudinal analysis of attrition behavior. The internal or external method of forming occupational interest scales used in Study 5 should be employed in Study 6. However, the main criterion variable will be attrition. These analyses should be conducted with one and two year attrition data, and possibly basic and technical training attrition data, to examine whether interests can be indicators of early attrition. These data will also be used to cross-validate empirically-keyed occupational interest scales.

We also recommend developing either a response validity scale to identify coached or socially desirable responding, or a set of empirically keyed items that form scales to identify this type of response pattern. The main benefit of both types of scales is that they are subtle and difficult to identify. If a response validity scale were developed the process would begin as part of Study 3. Additional data, however, would need to be

⁶ We would like to see the NRAP administered at one and two year follow-ups to examine whether vocational interests change as a function of experience in the Navy. These data could be important if differences between satisfied and dissatisfied groups are not significant.

collected from respondents known to be responding in a socially desirable manner (i.e., they would be instructed to try to respond in such a way that the results indicated they were best suited for a particularly desirable rating).

Summary. The outcome of Studies 5 and 6 will be a psychometrically sound and validated interest inventory with both basic interest and occupational interest scales. The inventory will be designed for use in the Navy's RIDE classification algorithm. The interest function in RIDE can be developed to match recruits to ratings that share similar empirically-keyed occupational profiles. Since the profiles reflect satisfied enlisted personnel who remain in the Navy for at least two years, the matching process will improve first term retention.

Phase III: Operational Evaluation within RIDE

Study 7: Operational Evaluation

The purpose of this study will be to evaluate the utility of using the Navy interest inventory in an operational setting to make classification decisions as part of the RIDE algorithm.

Evaluation Subjects. The subjects will be assigned to one of two independent recruit cohorts that are administered the Navy interest inventory at the MEPS as part of the recruiting and classification process. One group will provide baseline criterion data. While this group will complete the NRAP, interest information *will not* be used in making the rating assignment decision. The other group will provide experimental data, i.e., rating assignment decisions *will* be made, in part, with the individual's scores from the interest inventory. This design will provide evidence of the operational utility of the interest inventory in making classification decisions with RIDE.

Method. Several research designs that provide a means for independent collection of baseline and experimental data can be considered. We suggest a before-after design in which interest inventory data are collected for (at least) three months in both the baseline and experimental conditions. The baseline data collection would be conducted immediately before the experimental data collection. Alternatively, NPRST might entertain a more complex design, such as one in which interest data are collected at approximately the same time in the baseline and experimental conditions. One such design might be to randomly turn interest-based classifications on and off without the knowledge of users. Both types of designs have built-in limitations that must be recognized. The specific evaluation design will depend upon many operational and practical factors that cannot be anticipated at this time. Therefore, creating the design specifications should be the initial task of the study.

Analyses. Although assignments will be made to specific ratings, the data will be analyzed by occupational interest group to obtain adequate sample sizes. We recommend a longitudinal design that provides for the collection of the same criterion data as in Study 6. The main criterion variable will be attrition, which should be measured after basic and technical training, and at one-year intervals throughout the

first enlistment term.⁷ Although the results after one year should be fairly good indicators of long-term relationships, we strongly recommend collecting criterion data throughout the first enlistment term. Job satisfaction data also should be collected annually. In addition, data on training first-pass rates, training achievement, job performance, and discipline problems should be obtained, if possible.

The first set of analyses will replicate the item and scale analyses of preceding studies to insure that the instrument functions the same under validation and operational conditions. The second set of analyses will examine the relationships of recruit interests to the criteria across baseline and experimental groups. We would expect to see higher average satisfaction and retention rates in the experimental group. We also would predict that the interest profiles of satisfied personnel in both conditions (analyzed by occupational interest cluster) would be congruent with the interest profiles of the occupations to which they were assigned. Conversely, the interest profiles of unsatisfied enlisted personnel in both conditions, while constituting a smaller group in the experimental condition, should be significantly different from that of the occupational cluster of the rating to which they were assigned.

The third set of analyses we recommend is a utility study of the practical benefits of the interest inventory presented in terms of savings in recruiting, training and other personnel costs, and improvements in other types of variables most relevant to Navy policy makers and managers in stakeholder organizations. In fact, we would like to see NPRST develop a permanent DSS that monitors the utility of the recruiting, selection and classification processes on an on-going basis. The DSS could be used by managers and policy makers to conduct “what-if” type analyses for alternative recruiting scenarios. It also could be a tool to facilitate planning for and assessing the impacts of changes in the Navy’s manpower, personnel and training systems.

Summary. The outcome of Study 7 will be the final evaluation of the utility of the interest inventory implemented through RIDE. It also will include the development of group norms for the inventory based on the Navy recruit population and an investigation of subgroup differences. A critical design feature of this study must be consideration of and preparation for the effects of the implementation on users and other stakeholders. This part of the effort will be the final phase of Study 1.

Supplemental Recommendations

We limited our project plan to the development and validation of a Navy interest inventory. However, we suggest that NPRST consider including the inventory development team in the design process for the RIDE algorithm. The Navy will obtain the greatest utility from the classification algorithm if the measurement properties of each of the components and their interactions are fully articulated and understood. We believe this will require a team approach to developing the algorithm. The team members should be individuals who understand each of the algorithms’ functions and those who are knowledgeable about the operational aspects of the recruiting, selection and assignment processes. We suggest that discussions about the configuration of the

⁷ Again, we suggest obtaining interest data at each of these follow-up points in this study, if possible.

algorithm be held in conjunction with initial development of the inventory and periodically as the algorithm and interest inventory are developed and tested.

Another important consideration that does not directly relate to the development and validation of the Navy interest inventory is its administration. We recommend that NPRST researchers give thought to the timing and conditions of the administration of the interest inventory because these considerations will impact its utility. For example, the inventory could be made a Web-based application for use as a recruiting (as well as a retention) tool that is widely accessible. Similarly, recruiters could offer a paper-and-pencil or PC-based version to potential applicants early in the recruiting process. (And the availability of a Navy specific interest inventory could be highlighted in Navy advertising.) In each case the Navy's interest inventory may prove to be a successful tool for increasing the applicant pool and/or for providing added value to the applicant recruiting experience. More generally, the proper timing and method of administration of the interest inventory also could be used as a strategy for reducing the potential for coached or socially desirable responding.

Project Timeline

Study 1: Groundwork for a Navy Interest Inventory

Timeline: 2 to 3 Months

This study can begin at the same time as Study 2 and can run concurrently.

Study 2: Delineating the Navy Occupational and Interest Structure

Timeline: 8 to 10 Months

This estimate assumes that no formal job analysis procedure will be used.

Study 3: Development of the Navy Interest Inventory

Timeline: 6 to 8 Months

This research cannot begin until Study 2 has been completed. The estimate includes time for the development of the initial item pool. The majority of time allocated for this research will be for collecting data in the recruit and incumbent populations. Some additional time may be necessary if significant time and/or research is needed to develop the self-report criterion measures (i.e., Navy satisfaction, rating satisfaction, attrition propensity, desire to re-enlist).

Study 4: Development of Initial Navy Occupational Clusters

Timeline: 3 to 4 Months

Because the precise structure of Navy interests (an outcome of Study 3) must be understood prior to this research, this study cannot begin until Study 2 is completed.

Study 5: Concurrent Validity Study

Timeline: 8 to 12 Months

This research cannot begin until Study 4 is completed because we will use the initial occupational interest clusters (the outcome of Study 4) as the basis for sampling ratings. The primary time constraint will be obtaining incumbent self-report and objective data.

Study 6: Predictive Validity Study

Timeline: 21 to 24 Months at a Minimum

This research will begin at the same time as Study 5. The time estimate assumes that we test people for a period of six months and follow the sample for at least one-year. The need for a longitudinal design alone puts us 18 months out.

Study 7: Operational Evaluation of the Inventory

Timeline: 24 Months at a Minimum (48 Months Ideally)

This research should not begin until Study 6 has concluded. The 48-month option would follow individuals throughout their first term. However, sufficient data on one-year attrition likely could be obtained and analyzed within 24 months, so that the researchers could draw some conclusions regarding the utility of the instrument. While a decision to implement may be made after 24 months, we would recommend continuing the research through the full 48-month term.

Summary

Assuming that all results are positive and that transition from study to study is a continuous process, we estimate the time to implementation to be between 62 and 70 months, or approximately 5 to 6 years.

While we believe that each of the components identified in this research plan are important, we recognize that five to six years is a long time to wait to put an interest inventory into use. If the Navy were to find this timetable unacceptable, NPRST could consider shaving 12 months off the project timeline by eliminating the predictive validity study. However, this option is contingent on the assumption that incumbents who have been in Navy ratings for 1 to 1½ years have interest profiles that are similar to those of new recruits assigned to the same rating. Given the influences of military life on a young person and the present rates of attrition in all the Services, this assumption is not likely to be valid (Study 3 will produce some data on this). If the assumption is violated, the concurrent validity sample will not be sufficient to represent the true impacts of the instrument. Further, by dropping the predictive validation we would not be able to develop empirically-keyed scales until the operational evaluation.

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Appendix

**Military Interest Inventories
Reviewed by
William E. Alley**

**Published Civilian Interest Inventories
Reviewed by
Lenore W. Harmon
James Rounds**

Overview of Military Inventories

All military service-specific interest inventories documented between 1970 and the present were included in the survey. Any exclusions were inadvertent. Eight instruments were identified.

VOICE (Vocational Interest - Career Examination)

Most Recent Revision

Form E (Christal, 1994)

Publisher

Educational Testing Service (Form A)

Department of the Air Force (Forms B, C, D, & E)

Forms and Reading Level

Form A (400 items) 1973; 11-12th grade reading level

Form B (300 items) 1978

Form C (245 items) 1983

Form D (160 items) 1987

Form E (Form C updated and adapted for computerized administration) 1994

Medium of Presentation

Forms A–D—paper and pencil administration

Form E—administration via IBM 286 PC

Length (time)

45–50 minutes (Forms C & E)

Audience

High school students/military recruits seeking non-professional careers

Description of Items and Response Format

I. Occupational Titles

II. Work Tasks

III. Leisure Activities

IV. Desired Learning Experiences

Items administered in free-response Likert (L-I-D) format

Scores and Score Interpretation (Also, Include How Scores Are Linked to Occupations)

Basic Interest Scales (18)–Office Administration, Electronics, Heavy Construction, Science, Outdoors, Medical Service, Aesthetics, Mechanics, Food Service, Law Enforcement, Audiographics, Mathematics, Agriculture, Teacher/Counseling, Marksman, Craftsman, Drafting, Automated Data Processing

Occupational Scores (9) - Mechanical, Administrative, Technical and Allied Specialties, Electronics, Security and Support Services, Medical Care, Medical and Dental Technician, Utilities Maintenance

Occupational Area Scores (6) Mechanical, Administrative, Electronics, Medical Services, Law Enforcement, Radar/Air Traffic Control

Basic Interest Scores are factorially-derived homogeneous item clusters. Occupational and Occupational Area scores are empirically keyed to predict job satisfaction based on longitudinal follow-up 1-3 years after initial assignment. Occupational scores are reported in standardized format ($M = 100$; $SD = 20$)

Norms

Nation-wide normative group of 12,000 U.S. high school students in grades 10-12.

Air Force norms based on 20,000 male and female entrants

Recommendations

Appropriateness and usefulness of the items and scales for Navy interest scale development. Capacity of the instrument to discriminate Navy occupations/ ratings at useful level of generality. Distinctive features for Navy use

Advantages

Developed specifically for military use in counseling and job placement; broad item pool, recently updated; psychometrically sound development paradigm; national norms for high school students (somewhat dated); oriented toward non-professional careers; empirically keyed to predict satisfaction in military jobs based on large-scale longitudinal follow-up studies.

Disadvantages

Deficient in Holland coverage on Artistic, Social, and Enterprising dimensions (see C-MIS evaluation); May be deficient in Navy-specific scales (i.e., nautical interests); Environmental job factors not addressed - status, white vs. blue collar, transferability of skills.

Overall

Exemplary inventory. Capacity for discriminating among existing Navy jobs is considered moderate to high. Recommended as a primary source of items/scales for a Navy instrument. Could be supplemented with Holland-like content areas (as was done with C-MIS), work environment, and Navy-specific scales as required.

ACI (Army Classification Inventory)

Most Recent Revision

Form A (Bayroff & Fuchs, 1970)

Publisher

Department of the Army

Forms and Reading Level

Single form; 11–12th grade reading level

Medium of Presentation

Paper and pencil

Length (time)

Unknown

Audience

High school students and U.S. Army recruits seeking nonprofessional careers

Description of Items and Response Format

Items administered in free response Likert (L-I-D) format

Scores and Score Interpretation (Also, Include How Scores Are Linked to Occupations)

Area Scores (4): Combat, Mechanical, Electronics, and Administrative

Norms

Unknown

Recommendations

Appropriateness and usefulness of the items and scales for Navy interest scale development. Capacity of the instrument to discriminate Navy occupations/ratings at useful level of generality. Distinctive features for Navy use

Advantages

None

Disadvantages

Dated item pool; limited scale coverage; no obvious Holland overlap. Limited reliability/validity data, gender issues not effectively addressed.

Overall

Not recommended for follow-on activities due to limited capacity for discriminating among Navy jobs.

AVOICE (Army Vocational Interest- Career Examination)

Most Recent Revision

Unknown

Publisher

Department of the Army

Forms and Reading Level

Single form; 11–12th grade reading level

Medium of Presentation

Paper and pencil

Length (time)

30–35 minutes (est.)

Audience

High School students and Army Recruits

Description of Items and Response Format

I. Occupational Titles

II. Work tasks

III. Leisure Activities

IV. Desired learning Experiences

176 items administered in free response Likert (5-pt) format

Scores and Score Interpretation (Also, Include How Scores Are Linked TO Occupations)

Basic interest Scales (22) - Clerical Administrative, Mechanics, Heavy Construction; Electronics, Combat, Medical Services, Rugged Individualism, Leadership/Guidance, Law Enforcement, Food Service (Professional), Food Service (Employee), Firearms Enthusiast, Science/Chemical, Drafting, Audiographics, Aesthetics, Computers, Mathematics, Electronics, Communication, Warehousing/Shipping, Fire protection, Vehicle/Equipment Operator

Scores are reported in standard score format (M = 50; SD = 10)

Norms

U.S. Army recruits (Project A Sample)

Recommendations

Appropriateness and usefulness of the items and scales for Navy interest scale development. Capacity of the instrument to discriminate Navy occupations/ratings at useful level of generality. Distinctive features for Navy use

Advantages

Latest generation of Army interest inventories; updated item pool; provided new homogeneous content scales to supplement the VOICE in Combat, Leadership/Guidance, Vehicle/Equipment Operator, and Fire Protection; major contributor to Project A classification analysis; validity data well-documented.

Disadvantages

Army oriented—deficient in Navy specific scales; deficient in Holland coverage; shortened inventory may have sacrificed scale integrity; no national norms; gender issues not adequately addressed.

Overall

Recommend no follow-on development. May be source for updated items/scales for Navy application.

C-MIS (Civilian-Military Interest Survey)

Most Recent Revision

Gottfredson, 1988

Publisher

Department of the Navy

Forms and Reading Level

Single form; 11–12th grade reading level

Medium of Presentation

Paper and pencil

Length (time)

12–15 minutes (est.)

Audience

High school students and military recruits seeking non-professional careers

Description of Items and Response Format

I. Occupational Titles

II. Work tasks

III. Leisure Activities

IV. Desired learning Experiences

90 items administered in free response Lickert L-I-D format

Scores and Score Interpretation (Also, Include How Scores Are Linked to Occupations)

Subscales: Practical (R), Analytic (I), Creative (A), Helpful (S), Managerial/Persuasive (E), Organized/Careful (C) - Holland equivalents in parentheses

Norms

1350 U.S. Navy recruits

Recommendations

Appropriateness and usefulness of the items and scales for Navy interest scale development. Capacity of the instrument to discriminate Navy occupations/ratings at useful level of generality. Distinctive features for Navy use):

Advantages

Navy-sponsored development; good Holland coverage; updated item pool; good construct validity.

Disadvantages

Content coverage limited to Holland-like dimensions; limited normative data; limited criterion-related validity data; may not discriminate well among the full range of Navy occupations without a more comprehensive inventory to provide supplemental coverage (i.e., VOICE or AVOICE).

Overall

Recommended as potential source of Holland-like items and scales; excellent data on concurrent administration of the VOICE Basic Interest Scales and the Holland Scales.

JOB Scale (Job Orientation Blank)

Most Recent Revision

Peterson, Hough, Dunnette, Rosse, Houston, & Touquam, 1990

Publisher

Department of the Army

Forms and Reading Level

Single form; 11–12th grade reading level

Medium of Presentation

Paper and pencil

Length (time)

7-10 minutes (est.)

Audience

U.S. Army recruits

Description of Items and Response Format

38 items administered in free response Likert (5-pt) format

Scores and score interpretation (Also, include how scores are linked to occupations):

Subscales

Job Security, Job Status, Serve Others, Autonomy, Routine, Ambition

Norms

U.S. Army recruits (Project A sample)

Recommendations

Appropriateness and usefulness of the items and scales for Navy interest scale development. Capacity of the instrument to discriminate Navy occupations/ratings at useful level of generality. Distinctive features for Navy use

Advantages

Unique work environment subscales

Disadvantages

Limited content coverage without supplemental interest battery; limited criterion related validity; limited normative data

Overall

Not recommended for follow-up except as possible source of work environment scales

NVII (Navy Vocational Interest Inventory)

Most Recent Revision

Form B (Pass, Abrahams, Cole, & Edwards, 1996)

Publisher

Department of the Navy

Forms and Reading Level

Form A, 11–12th grade reading level

Medium of Presentation

Paper and pencil

Length (time)

60 minutes (est.)

Audience

High school students and U.S. Navy recruits seeking non-professional careers

Description of Items and Response Format

190 forced choice item triads (Like most, like least)

Scores and Score Interpretation (Also, Include How Scores Are Linked to Occupations)

Area Scales (9)—Mechanical, Health, Office, Electrical, Food Service, Carpentry, Sales Office, Clean Hands, Outdoors

Occupational Scales (15)—Quartermaster, Sonar Technician, Electronics Technician, Radioman, Data Processing, Store Keeper, Commissary Man, Engine Man, Boiler Man, Electricians Mate, Equipment Operator, Aviation Ordnance Man, Air Control man, Aviation Electrician, Hospital Corpsman

Non-traditional Interest Scales (3)—Non-traditional Interest, Construction/Fabrication, Mechanics

Area Scales are keyed to reflect interests in homogeneous content domains. Occupational Scales are keyed (Clemans' Lambda) to index the similarity of the respondent's interest profile to persons in designated Navy ratings (jobs).

Norms

Abrahams

Recommendations

Appropriateness and usefulness of the items and scales for Navy interest scale development. Capacity of the instrument to discriminate Navy occupations/ratings at useful level of generality. Distinctive features for Navy use

Advantages

Navy-developed item pool, recently updated; provide Area and Occupational Scales; model categorization scheme for representative Navy ratings.

Disadvantages

Iterative forced-choice item format; limited predictive validity data.

Overall

Instrument not recommended for further development; categorization of Navy ratings could serve as useful starting point for predictive validation effort. Updated Item pool may be source of free-response items in selected content areas.

OIS (Occupational Interest Survey)

Most Recent Revision

Leighton, Smith, Macomber & Viera, 1995

Publisher

Department of the Air Force

Forms and Reading Level

Single form, 11–12th grade reading level

Medium of Presentation

Paper and pencil

Length (time)

10 minutes (est.)

Audience

Air Force recruits

Description of Items and Response Format

28 Air Force generic job titles administered in free response Likert (10-pt) format

Scores and Score Interpretation (Also, Include How Scores Are Linked to Occupations)

Job preference listing

Norms

1000 Air Force recruits

Recommendations

Appropriateness and usefulness of the items and scales for Navy interest scale development. Capacity of the instrument to discriminate Navy occupations/ratings at useful level of generality. Distinctive features for Navy use

Advantages

Simple direct assessment of job preferences

Disadvantages

Extremely limited measurement capability

Overall

Instrument not recommended for follow-on development; methodology may have utility in establishing baseline preferences for Navy ratings

NVIS (Navy Vocational Interest System)

Most Recent Revision

Yellen & Foley, 1978

Publisher

Department of the Navy

Forms and Reading Level

Single form, 11–12th grade reading level

Medium of Presentation

Computer

Length (time)

10-15 minutes (est.)

Audience

High school students seeking nonprofessional careers and U.S. Navy recruits

Description of Items and Response Format

279 job titles (pick 2 of interest)

5 questions related to DOT work environments (forced-choice dyads).

Scores and Score Interpretation (Also, Include How Scores Are Linked to Occupations):

None—respondent interacts with the computer until a vocational choice is made

Norms

None

Recommendations

Appropriateness and usefulness of the items and scales for Navy interest scale development. Capacity of the instrument to discriminate Navy occupations/ratings at useful level of generality. Distinctive features for Navy use

Advantages

Combines interests and other relevant considerations (aptitudes, educational aspirations, etc.) a computerized vocational counseling setting

Disadvantages

Exclusive use of job titles; forced choice item format (for work environments); no construct validation; no concurrent/predictive validity data

Overall

Not recommended for follow-up

Interest Profiler (IP)

Most Recent Revision Date

1999 (Not yet released)

Publisher

U.S. Department of Labor

Forms

One form available.

Reading Level

Eighth grade level.

Medium of Presentation

IP is available in a paper and pencil form (self-scored) and computerized form.

Length (time)

15-30 minutes.

Audience

IP is intended for use by a wide variety of populations, including workers in transition, unemployed workers, college students, and junior high and high school students. IP is designed for clients who are 14 years of age or older.

Items and Response Format

IP is an interest inventory composed of 180 items with 30 items per scale. Each item is a work-related activity. The response options for each of the items are “Like,” “Dislike,” and “?” The question mark option signifies that respondent is unsure of whether he/she likes or dislikes the activity.

Scores Available

The inventory is designed to assess Holland personality-interest types and reports the following scores: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. The RIASEC scale scores are a sum of the number of like responses. As with other Holland inventories, the two or three highest scores are usually reported.

Norms

None available.

Score Interpretation

The six basic interest types are interpreted according to Holland’s RIASEC model.

Score Linked to Occupations

RIASEC profile scores (or high point codes) are linked to over 1,100 Occupational Units (occupations) in the Department of Labor O*NET. The O*NET has replaced the Dictionary of Occupational Titles.

Recommendation

If the Navy decides to use an existing Holland RIASEC measure, we would not recommend the IP since there is a better measure of Holland interest types, the ACT UNIACT-R (see UNIACT-R recommendation). The use of IP raw scores (similar to the VPI, SDS, and CDM-R) with their large sex-differences, would lead to many female applicants being assigned to Social and Conventional occupations and few female applicants being assigned to Realistic occupations. Furthermore, like other Holland type measures (e.g., UNIACT, CDM, VPI, SDS-R), the IP scores as currently used can not distinguish among many of the Navy’s Realistic occupations/ratings.

Jackson Vocational Interest Survey (JVIS)

Publisher

Sigma Assessment Systems, Inc.

Most Recent Revision Date

Manual published in 1977. Items revised in 1990.

Forms

One form.

Reading Level

Seventh and eighth graders with average reading levels.

Medium of Presentation

Paper and pencil (machine-scored or hand-scored) and computer software administration and scoring.

Length (time)

45–60 minutes

Audience

Senior high school, college and university, Adult

Items and Response Format

Test takers are required to select the more interesting or preferred statement between 289 pairs of work-activities.

Scores Available

The report contains a variety of types of scales and profiles: 10 General Occupational Themes (Expressive, Logical, Inquiring, Practical, Assertive, Socialized, Helping, Conventional, Enterprising, and Communicative), 34 Basic Interest Scales, 6 Administrative Indices, Similarity to 17 University Academic Majors clusters, and Similarity to 32 Occupational Clusters.

Norm Groups

Combined group of high school and college students with separate norms for males (N = 500) and females (N = 500).

Score Interpretation

General Occupational Theme scales measure broad patterns of interests and have a similar interpretation as Holland types. Of the 34 Basic Interest Scales (BI), 8 BI scales reflect Work Style preferences (e.g., Dominant Leadership, Job Security, Stamina, Accountability) and 26 BI scales assess Work Role preferences (e.g., Creative Arts, Physical Sciences, Engineering, Life Sciences). The Work Role scales reflect preferences for on the job activities and are similar to the Basic Interest scales of the Strong. Administration indices include a reliability index that identifies persons who have answered non-purposefully or randomly.

How Scores Are Linked to Occupations

Similarity scores are reported for 32 Occupational Clusters (e.g., Health Service Workers, Occupations in Religion, Life Sciences, Engineering, and Technical Service Workers).

Recommendations

We cannot recommend the JVIS. At the time of its release in 1977, the JVIS was recognized for the sophisticated strategies used in scale development. Twenty years later, very little research has been conducted on the JVIS scales. Other than the initial scale construction research there has been little research examining the validity of the occupational clusters. The occupational clusters need to be updated since they were developed from analysis of Strong Vocational Interest Blank Occupational scales and Basic Interest scales taken from Campbell (1972). Also, the occupational cluster structure is too broadly conceived to be able to discriminate among the Navy ratings. Furthermore, a major limitation of the JVIS for Navy use is the lengthy time required for taking and interpreting the test.

Ohio Vocational Interest Survey, 2nd Edition (OVIS II)

Most Recent Revision Date

Student booklet published in 1981. Manual published in 1983.

Publisher

Psychological Corporation

Forms

One form

Reading Level

Sixth Grade

Medium of Presentation

Paper and pencil, machine- or hand-scored and computerized version.

Length (time)

30 minutes

Audience

Grades 7 to 12, college, adult.

Items and Response Format

253 items describing work activities (e.g., Identify hearing problems and plan treatment)

Scores Available

OVIS II is based upon the idea that every occupation requires some degree of interaction with data, people, and things. Beginning with the Dictionary of Occupational Titles (U.S. Department of Labor, 1977), 23 Occupational clusters were developed by clustering occupations according to their involvement with data, people, and things. Then, items (11 per scale) were written for each cluster.

Norms

46, 000 students enrolled in grades 7–12

Score Interpretation

Percentile ranks (same sex and opposite sex) are reported for cluster scores separately for females and males in grade groups 7 through 12, and college. The interest score represents the strength of individual's liking the activities for the particular cluster.

Scores Linked to Occupations

Scores are given directly for the occupational clusters.

Recommendations

It is not recommended since the manual reports no validity studies using the second edition. Nevertheless, the methodology of developing clusters and writing items could be adapted for the development of Navy interest scales.

Unisex Edition of the ACT Interest Inventory Revised (UNIACT-R)

Most Recent Revision Date

1995

Publisher

American College Testing Program, Iowa City, Iowa

Forms and Reading Level

UNIACT-R consists of two levels each having a separate set of items: Level 1 (reading grade level is 6.6) is intended for persons in Grades 8-12 and Level 2 (reading grade level not reported) is intended for college students and adults.

Medium of Presentation

The UNIACT-R is packaged with other career and ability measures and is involved in at least eight career programs (e.g., DISCOVER, ACT Assessment Program, Career Planning Program). Depending on the career program, the UNIACT-R is available as a computerized inventory or paper-pencil inventory (self-scored or machine-scored).

Length (time)

Not reported.

Audience

UNIACT is intended for use by persons who are in the early stages of career planning (8th grade to college students).

Items and Response Format

UNIACT-R has 90 items describing work-related activities (e.g., “sketch and draw pictures,” “balance a checkbook,” “build a picture frame”). The response options for each of the items are “dislike,” “indifferent,” and “like.”

Scores Available

UNIACT-R reports results for six basic types of vocational interests (Technical, Science, Arts, Social Service, Business Contact, Business Operations) that correspond to Holland’s six interest types.

Norms

Normalized standard scores are reported based on combined-sex norm groups. There are separate norms for Grade 8, Grade 10, Grade 12, and college students and adults. UNIACT-R norms are based on nationally representative samples of students.

Score Interpretation

UNIACT-R six basic interest types are interpreted similar to Holland’s RIASEC types.

Score Linked to Occupations

Interest inventory results are related to a region on the World-of-Work Map (WWM). The WWM arranges job families (groups of similar occupations into 12 regions) based on two-dimensions of People-Things and Ideas-Data that are overlaid on Holland’s RIASEC circular structure. Technically, the job families cover all U.S. DOT occupations. Practically speaking, the job families are linked to Job Family Charts that list over 500 occupations employing more than 95 percent of the workers in the U.S. labor force.

Recommendation

If the Navy decides to use an existing Holland RIASEC measure, we would recommend the UNIACT-R because the American College Testing program has used a “unisex” approach to the item construction, developing an item pool with similar response distributions for women and men. Another nice feature of the UNIACT-R is the methodology used to create job families. These same methods could be applied to Navy occupations/ratings. Nevertheless, like other Holland-type measures, the UNIACT-R scores as currently used cannot distinguish among many of the Navy Realistic occupations/ratings. Furthermore, Swaney (1995, p. 2) cautions against using the UNIACT for placement decisions, stating that “UNIACT-R provides focus to career exploration; not a focus that singles out the “right” occupation, but rather one that points to regions of the world of work that individuals may want to visit and explore.”

Vocational Preference Inventory (VPI)

Most Recent Revision Date

1985

Publisher

Psychological Assessment Resources, Inc., Odessa, FL

Forms

1985 VPI is the 8th revision beginning with the 1953 form. Three research forms are available.

Reading Level

Not reported.

Medium of Presentation

VPI is available as a paper and pencil form (self-scored and machine-scored by operator entry of response to the computerized version) and computerized form.

Length (time)

15–30 minutes

Audience

VPI is intended for use by high school, college students, and adults.

Items and Response Format

VPI is a personality-interest inventory composed of 90 occupational title items. The response options for each of the items are “yes” for occupations that are appealing or interesting and “no” for occupations that are disliked or uninteresting.

Scores Available

The inventory has 11 scales: Realistic, Investigative, Artistic, Social, Enterprising, Conventional, Self-Control, Masculinity-Femininity, Status, Infrequency, Acquiescence.

Norms

Author recommends using raw scores, but percentile ranks are reported in the manual by sex for college freshman and employed adults. Means and standard deviations are reported by sex for midwestern two-year college sample and other diverse groups.

Score Interpretation

The six basic interest types are interpreted according to Holland's RIASEC model. Self-Control assesses "what is generally meant by self-control and over control of impulses;" Masculinity-Femininity assesses "choice of traditionally masculine occupational roles;" Status assesses "vocational choices with high prestige rankings;" Infrequency assesses "preferences for unpopular, female-dominated, low status occupations;" Acquiescence assesses "people who prefer many occupations."

Score Linked to Occupations

RIASEC raw scores (high-point codes) can use the Self-Directed Search Occupational Finder and The Dictionary of Holland Occupation Codes to match interests with occupations.

Recommendation

If the Navy decides to use an existing Holland RIASEC measure, we would not recommend the VPI since there is a better measure of Holland interest types—ACT UNIACT-R. The ACT program has used a "unisex" approach to the item construction, developing an item pool with similar response distributions for women and men. The use of VPI raw scores with their large sex differences would lead to many female applicants being assigned to Social and Conventional occupations and few female applicants assigned to Realistic occupations. Furthermore, like other Holland-type measures, the VPI scores as currently used would not distinguish among many of the Navy's Realistic occupations/ratings.

Harrington-O'Shea Career Decision-Making System-Revised (CDM-R)

Most Recent Revision Date

1993

Publisher

American Guidance Service, Inc., Circle Pines, MN

Forms

Level 1 edition (interest inventory)

Reading Level

Seventh grade

Medium of Presentation

Paper and pencil self-scored

Length (time)

20 minutes

Audience

Grades 7 to 12, college, adults

Items and Response Format

The CDM-R features a 96-item interest inventory (Level 1). Scores are determined on basis of 2 points for "Like the Activity," 1 point for "Can't Make Up Your Mind," or 0 points for "Dislike the Activity." All the items are job activities.

Scores Available

The CDM-R is based on Holland's theory of vocational personalities. The CMD-R uses 20 items to assess five of the six scales (Holland scale in parenthesis): Crafts (Realistic), Arts (Artistic), Social (Social), Business (Enterprising), and Office Operations (Conventional).

Norms

Authors recommend using raw scores, but percentile ranks are reported in the manual by sex and by grades 7-9, 10-12, college freshman, and adults.

Score Interpretation

Scores are summed and raw scores are used to determine the highest scoring interest areas. The scores are interpreted in the context of Holland's theory with reference to values, abilities, and school subjects for each of the six interest scores.

Link to Occupations

Eighteen job clusters are provided with at least two clusters for each of the six scales. These clusters have typical jobs listed, as well as the abilities, school subjects, and job values for the job clusters. The CDM-R is also linked to Department of Labor Guide for Occupational Exploration.

Recommendations

It is hard to recommend the CMD-R (Level 1) when there are other Holland inventories with a much larger body of validity and reliability evidence (e.g., UNIACT-R). It is unclear whether or not Holland type measures that report broadband interest areas can discriminate Navy occupations/ratings at useful level of generality. Another reason not to recommend the CDM-R is its use of raw scores to determine primary interest areas. The use of raw scores is not desirable since it leads to gender bias in score reporting.

Career Assessment Inventory—Vocational Version

Most Recent Revision Date

1984

Publisher

National Computer Systems

Forms

The inventory was first published in 1976. The current form is entitled the second edition although there appear to have been some intermediate revisions as well.

Reading Level

Sixth grade

Medium of Presentation

Paper and pencil administration using machine scoreable booklets that combine the inventory and answer sheet. Also available in on-line administration.

Length

The CAI-Vocational version has 305 items. It takes about 30 minutes.

Audience

High school and vocational technical students, and adults planning to enter the work force after two years of training or less.

Items and Response Format

The 305 items are presented in three categories, Activities (151 items), School Subjects (43), and Occupations (111). All of the items are answered by responding on a five point scale ranging from “like very much to dislike very much.” It is commendable that items evidencing large gender differences were not included unless they were important in scale construction.

Scores Available

The CAI has four types of scales. The first are six General Theme scales that are based on Holland’s typology. Second are 22 Basic Interest Area scales that are somewhat more specific than the General Theme scales. In general these two types of scales were developed using techniques that cluster items. Third are 91 Occupational scales. These were developed using techniques that differentiate occupational group members from a general reference sample composed of volunteer student and adult participants equally distributed over the six Holland types. It is worth noting that there is one Occupational Scale for each occupation appropriate for both men and women and that the 1200 member general reference sample was composed of equal numbers of men and women. These were developed by only including items that differentiated women in the occupation from the women in the General Reference sample *and* that differentiated men in the occupation from the men in the General Reference sample. Finally, there are a number of Administrative and Non-occupational scales. They include several scales indicating response patterns, a fine arts-mechanics scale designed to measure traditionally feminine and masculine occupational interests, an occupational extroversion introversion scale, an educational orientation scale, and a variability of interests scale.

Norms

The General Themes and Basic Interest Area scales were normed on a general reference sample including 750 of each sex. Because there are gender differences the profile report shows the middle 50 percent of scores for both sexes. Basic Interest Scales were normed in exactly the same way. Occupational Scales were normed on members of the occupational groups (weighted as necessary so that the effect of different male and female sample sizes was eliminated). The middle third of the general reference sample (separate for males and females) is graphed on the report form.

Score Interpretation

On the profile the Basic Interest Area scales and the occupational scales are arranged by Holland typology. The General Themes and the Basic Interest Area scales are interpreted as evidence of somewhat general level of interests whereas the Occupational scales are interpreted as evidence of how an individual's interests compare with the interests that differentiate people in an occupation from people in a general sample. The type of scale that is most relevant depends on the needs of the individual.

How Scores Are Linked to Occupations

The General Themes and the Basic Interest Area scales are theoretically linked to the Holland typology, which has been shown to apply to occupations as well as individuals. In addition, occupational groups tend to score high and low on the appropriate scales. The occupational scales are linked directly to occupations because they are developed and normed on occupational groups.

Recommendations

Because the CAI-Vocational version was developed for individuals who are planning to enter non-professional occupations, its items and scales would have a great deal of face validity for naval enlistees. However, they are not directly linked to naval ratings. It has a variety of types of scales available. The Occupational scales use both positive and negative responses and are thus not as susceptible to manipulations as the more transparent homogeneous scales. Commendable attempts have been made to develop an instrument that represents sex differences fairly and minimizes them.

Career Assessment Inventory—Enhanced Version

Most Recent Revision Date

1986

Publisher

National Computer Systems

Forms

The inventory was first published in 1976. That version was revised in 1978 and in 1982 as the Career Assessment Inventory-Vocational.

Reading Level

Eighth grade

Medium of Presentation

Paper and pencil administration using machine scoreable booklets that combine the inventory and answer sheet. Also available in on-line administration.

Length

The CAI-Enhanced version has 370 items. College students and adults require about 40 minutes to complete the inventory.

Audience

High school, vocational technical, and college students; adults.

Items and Response Format

The 370 items are presented in three categories, Activities (200 items), School Subjects (43), and Occupations (127). Two hundred ninety two items overlap with the original version, which was designed for people seeking entry to non-professional occupations, either directly or from vocational-technical schools or community colleges. The 78 new items in this version were designed to expand the coverage to be more relevant to professional occupations. All of the items are answered by responding on a five-point scale ranging from “like very much to dislike very much.” It is noteworthy that the occupational items include a phrase

characterizing the activities of the occupation as well as the occupation name. It is also commendable that items evidencing large gender differences were not included unless they were important in scale construction.

Scores Available

The CAI has four types of scales. The first are six General Theme scales that are based on Holland's typology. Second are 25 Basic Interest Area scales that are somewhat more specific than the General Theme scales. In general these two types of scales were developed using techniques that cluster items. Third are 111 Occupational scales representing 111 occupations, 22 of them new and more professional than the 1982 Vocational version, 87 of them the same as those in the 1982 vocational version, and 2 of the 1982 scales slightly revised. These were developed using techniques that differentiate occupational group members from a general reference sample composed of volunteer student and adult participants equally distributed over the six Holland types. It is worth noting that there is one Occupational Scale for each occupation appropriate for both men and women and that the 900 member general reference sample was composed of equal numbers of men and women. These were developed by only including items that differentiated women in the occupation from the women in the General Reference sample *and* that differentiated men in the occupation from the men in the General Reference sample. Finally, there are a number of Administrative and Non-occupational scales. They include a scale for infrequent responses, several scales indicating response patterns, a fine arts-mechanics scale designed to measure traditionally feminine and masculine occupational interests, an occupational extroversion-introversion scale, an educational orientation scale, and a variability of interests scale.

Norms

The General Themes and Basic Interest Area scales were normed on the general reference sample described above. Because there are gender differences the profile report shows the middle 50 percent of scores for both sexes. Basic Interest Scales were normed in exactly the same way. Occupational Scales were normed on members of the occupational groups (weighted as necessary so that the effect of different male and female sample sizes was eliminated). The middle third of the general reference sample (separate for males and females) is graphed on the report form. The Fine Arts-Mechanical scale and the Variability of Interests scale were normed using general reference groups, while the occupational extroversion-introversion scale and the educational orientation scale were not.

Score Interpretation

On the profile the Basic Interest Area scales and the occupational scales are arranged by Holland typology. The General Themes and the Basic Interest Area scales are interpreted as evidence of somewhat general level of interests whereas the Occupational scales are interpreted as evidence of how an individual's interests compare with the interests that differentiate people in an occupation from people in a general sample. The type of scale that is most relevant depends on the needs of the individual.

How Scores Are Linked to Occupations

The General Themes and the Basic Interest Area scales are theoretically linked to the Holland typology, which has been shown to apply to occupations as well as individuals. In addition, occupational groups tend to score high and low on the appropriate scales. The occupational scales are linked directly to occupations because they are developed and normed on occupational groups.

Recommendations

The CAI was developed as a sort of clone of the Strong Interest Inventory (then called the Strong Campbell Interest Inventory). However, it avoids some of the problems the Strong would present if administered to Naval enlistees or recruits. It does not have separate scales by gender. Items were selected to minimize sex bias. It was originally developed as a measure for lower level occupations so it has greater face validity for our purposes than the SII both in terms of items and scales for individuals considering various naval ratings. Its item pool probably could be used to develop scales for naval ratings not currently covered by available scales. It contains validity checks and non-occupational scales that could inform an instrument developed for naval recruits.

Campbell Interest and Skill Survey

Most Recent Revision Date

First published 1992. No revisions

Publisher

National Computer Systems

Forms

Original form only

Reading Level

Estimated at sixth grade level

Medium of Presentation

Paper-and-pencil. Booklet combines inventory and answer sheets. Machine scoring is required. Computerized administration is also available.

Length

The CISS has 200 interest items and 120 skills items. No estimate of the time required is available, but it should be comparable to similar inventories, 30–40 minutes.

Audience

High school students to adults. Proposed not only as an aid to career development but as an aid to interpersonal understanding.

Items and Response Format

The 200 interest items are presented in 3 sections. There are 86 occupational items each containing the name of an occupation and a short descriptor. There are 43 school subject items and 72 activities items. In each case a 6-point response scale is used, although the anchors are different. For occupations and activities they are “strongly like and strongly dislike.” For school subjects they are “yes; yes, I would definitely like to study this; no; and no, I definitely would not like to study this.” Note that no middle point is provided. The 120 skills items also have a 6-point format ranging from “expert to none.” In developing items careful attention was given to choosing items that were clear and not time or culture bound.

Scores available

There are interest and skills score available. Within these 2 major categories there are 7 pairs of Orientation Scales, 29 pairs of Basic Scales, and 58 pairs of Occupational Scales. The Orientation Scales were developed somewhat differently from other scales of this type. The Basic Scales were developed first and their scores were analyzed using principal components analyses to find more general dimensions. This produced components, which are fairly similar to the Holland types except that the Realistic scale is represented by two scales—Producing and Adventuring. Names from Holland’s theory were not used. It appears that the interest scales were primary in making decisions about Orientation and Basic scales. All of the scales of the CISS are quite short. Their length probably accounts for the fact that their reliabilities (both alpha and test-retest) are somewhat lower than scales on similar inventories although still acceptable.

There are also some Special Scales and Procedural Checks. Included in the former are pairs of interest and skills scales for Academic Focus, Extroversion, and Variety. Included in the latter are pairs of interest and skills scales that are checks for response percentages, omitted items and inconsistencies.

Norms

All of the scales on the CISS are normed so that a reference group has a T-score of 50. For the orientation scales and the basic scales this group is composed of all of the members of 65 occupational groups sampled in the development of occupational scales (1790 females and 3435 males) with the genders equally represented. The standard deviations were established by using the median standard deviation of the 65 occupational groups. The occupational scales were normed somewhat differently. Unlike other interest scales of this type, a T-score of 50 was developed for each scale using a reference sample. However, the reference sample used for the orientation and basic scales was weighted for each occupational comparison so that the percentage of males and females in the reference sample matched the percentage in the occupational group. There are a number of problems with these procedures. Although the T-scores appear to be comparable, they are actually based on very different comparisons. Some occupational groups had very small representations of females. For instance, the police officer scale contained only 1 woman of 148 participants-less than 1 Percent. Obviously, this is a male scale although the claim is made that the scales are unisex. This is not an isolated example. Even the group used for the orientation and basic scales was not balanced occupationally. Some occupational groups were represented by as few as 35 members. The largest group is represented by 199.

Score Interpretation

On the profile all of the scales (excluding special and check scales) are organized by Orientation. Interest and skills scales are presented together so that a comparison can be made. Respondents are encouraged to pursue, develop, explore, or avoid areas based on the pattern of interests and skills. As with other inventories of this type, the more general orientation and basic scales are taken as indicators of general levels of interest whereas the occupational scales are taken as indicators of interests similar to individuals in the occupation.

How Scores Are Linked to Occupations

As with other inventories of this type, the occupational scales are linked to occupations directly because they were developed using occupational criterion groups. The orientation and basic scales are linked in that occupational groups generally score appropriately.

Recommendations

The CISS cannot be recommended for use because of the small occupational groups on which it is based and because of the fact that its not all its scales are truly unisex scales. The use of differentially weighted reference groups is also a major problem. The orientation scales offer no advantages over the Holland typology. The number of occupational scales is limited and for the most part they are for professional occupations. The latter should be a consideration in applications for Naval enlistees.

Despite the fact that the CISS cannot be recommended it has some elements that might be considered if the Navy were to build an interest inventory. The interest/skills comparisons are useful in counseling. Note that the skills scales were not reviewed in detail here. The use of a reference group mean on the occupational scales with an indicator of how much higher the occupational groups scored graphed on the profile is an improvement over the usual use of the reference group to norm general and basic scales while occupational groups are used to norm occupational scales. The particular reference groups used here are problematic, but the method could be less confusing than the more popular alternative.

Interest Finder

Most Recent Revision Date

1995

Publisher

U.S. Department of Defense

Forms

Only one form is available

Reading Level

Items were written to be comprehensible to high school students.

Medium of Presentation

The IF is part of "Exploring Careers: the ASVAB Workbook." It is a paper and pencil inventory that is self-scored.

Length

The IF has 240 items. It can be completed in less than a half-hour and scored in ten minutes according to the manual (prepublication copy).

Audience

Secondary and post-secondary students

Items and Response Format

The 240 items are presented in Holland categories. Within each category there are 14 activities items, 12 training items, and 14 occupations items. Response choices are limited to Like and Dislike to induce respondents to make a choice. Unfortunately, the instructions tell respondents to respond Dislike if they are unsure. Item development included using expert judges to assign items to types, screening for sensitivity, comprehensibility, and familiarity (using a panel of high school students). Initial tryouts further selected items that had minimal differences in endorsement rates between men and women, Blacks and Caucasians, Hispanics and Caucasians, and among socioeconomic statuses.

Scores Available

Scales are available for the six Holland types of interests.

Norms

Gender specific norms (to account for gender differences in scores on some scales) are presented in the ASVAB workshop. The source of these norms is not clearly spelled out but the N is comparable to the N in the high school validation sample that was drawn from students in 22 schools in 20 states. The mean age was 16.4. The group was 55 percent female and 63 percent Caucasian. The largest ethnic group was Hispanics at 13%. Average Socioeconomic level was middle class with a wide range of levels. Normed scores are used to derive a three letter Holland code for each individual.

Score Interpretation

The ASVAB Workbook leads the respondents to consider their three letter Holland Code in relationship to abilities (based on ASVAB), values (self rated), and preferred educational level using the Occufind a list of 200 Civilian and Military Occupations arranged according to primary Holland type. Many of the occupations listed are at a higher level than those to which naval enlistees might aspire.

How Scores Are Linked to Occupations

At present there is no data linking IF scores to occupations. There is a considerable amount of evidence linking IF scores to other inventories based on the Holland typology that do provide evidence of such linkages. Occupations on the Occu-find were assigned to Holland types by a panel of eight experts.

Recommendation

Imbedded as it is in a complete program, the IF probably is not useful for the purposes of the Navy. It is worth noting that it could be used outside of that program if an inventory based on Holland's theory is needed. Indeed, one of the samples used for form tryout and validation contained nearly 2300 military recruits. There may be data available that would provide more evidence about the usefulness of the IF for this sample. One problem is that the structure of the Holland typology is very clear from the format in which the items are presented. In this it is similar to the Self-Directed Search. Whether or not this effects responses is an empirical question, which may be important in a setting where faking to get into desirable ratings is a potential problem.

Kuder Occupational Interest Survey, Form DD

Most Recent Revision Date

1991

Publisher

CTB/Macmillan McGraw Hill

Forms

The Kuder was originally introduced in 1939. There have been several earlier forms that incorporate different scales and methods of scale development. There is a form E, which is for younger respondents and a form C, which is a much earlier version and is still available. These are the only current forms.

Reading Level

Approximately sixth grade

Medium of Presentation

The Kuder is administered in paper and pencil format in a booklet that combines the items and a machine scorable answer sheet. It is also available on-line.

Length

No time estimates are given in the manual for completing the Kuder's 100 items. However, they should take most respondents less than a half-hour.

Audience

High school and college students, adults

Items and Response Format

There are 100 items on the Kuder. Each item consists of three activities. Activities were selected because they related to the ten occupational areas that were represented on Form C, the five preferences for work styles from the Kuder Preference Record, Personal, or two additional work styles identified more recently. The respondent must choose the most and least liked from each triad. Because the items are activities they avoid appealing to either professional or non-professional respondents exclusively.

Scores Available

The Kuder offers five different types of scores. The Vocational Interest Estimates (VIEs) are the 10 occupational areas represented by somewhat longer scales the earlier Kuder inventories. The 109 Occupational scales represent 76 occupational groups with 33 having paired scales based on males and females. There are 43 single sex scales, 32 of them based on males. Many of the single sex scales are for non-professional level occupations and they follow traditional sex stereotypes. For example, there is a male-based scale for plumber and a female-based scale for secretary. The Kuder offers 26+14 40 scales for College Majors with 14 having paired scales based on males and females. There are 12 single sex scales, 8 based on males and 4 based on females. As with the Occupational scales, the single sex scales imply some gender stereotyping. One of the male College Major scales is Service Academy Cadet. The Verification scale was designed to determine whether respondents were insincere and is based on items that are answered infrequently in the keyed direction. The eight Experimental Scales are further attempts at detecting insincere responding and may also give some evidence regarding the maturity of the respondents. For each sex there are scales for the group itself and for Best Impression. There are scales for Fathers, Sons, Mothers, and Daughters.

Norms

The VIEs are normed on separate groups of males and females (Ns unspecified), which were submitted for scoring from high schools, colleges, and private agencies. The Occupational Scales and College Major scales were developed from a comparison of the responses (actually the pattern of responses to each item) of individuals with the responses of the group of people who are in that occupation or college major. A lambda coefficient expresses the similarity of the test taker to each group. Lambda coefficients are comparable within individuals but not across individuals, so the actual level of the coefficient is less important than differences among them. Consideration of occupations and majors within .07 of the highest lambda coefficient is recommended and the profile groups the occupations separately by sex in this manner. The verification scores are raw scores but decision rules (which also include consideration of the number of unmarked answers and the level of the highest lambda coefficient) are based on them. The Experimental Scales were normed on appropriate groups and the lambda score technology was used.

Score Interpretation

As indicated above, the most important scores are based on lambda which can be compared within individuals but not across individuals. The existence of both male and female scores for the same occupations and college majors creates interpretive problems when they do not agree fairly closely.

How Scores Are Linked to Occupations

Both the Occupational Scores and College Major scores are linked to the criterion of membership because the average group responses to which individual's responses are compared are based on members of the group. In general, the groups are large enough to be stable and represent a committed and satisfied membership.

VIE scores are not linked to occupations directly. They appear to be based on clustering interests at a level of specificity that is a bit greater than the Holland typology.

Recommendations

The Kuder has characteristics that would make it difficult to use directly in an application by the Navy, although it offers several desirable characteristics as well. The lambda scores are difficult to interpret and because they are not comparable across individuals they would be difficult to use in predictive algorithms. The use of separate scales for males and females suggests gender stereotyping. The sheer number of scales provided is also a potential problem. Many of the scales are for professional occupations that would not appear to apply to the differentiation task at hand. The forced choice triad item format is

not an optimal strategy for scale development. On the positive side, the use of scales reflecting academic interests could be useful in differentiating naval enlistees. Many of the occupational scales reflect interests that may be at an appropriate level for naval enlistees (unfortunately they are usually single sex scales). The use of the forced choice triad format for responding decreases opportunities for response bias but has other problems as noted above. The fact that the Kuder inventory has been able to make use of actual group members in scale construction without utilizing a general reference sample (which has its own unique characteristics) may also be a desirable feature.

The Minnesota Vocational Interest Inventory

Most Recent Revision Date

1965. Apparently out of print

Publisher

Psychological Corporation

Forms

No other published forms although the Naval Vocational Interest Inventory is probably based on work done by the author, Kenneth Clark.

Reading Level

Not available for this form, although it was revised from an earlier form with too high a reading level. This shows that some attention was paid to reading level.

Medium of Presentation

Paper-and-pencil. The inventory required machine scoring due to the complexity of scoring.

Length

The MVII contained 158 triads of items. Time for completion was not estimated.

Audience

Men aspiring to skilled trades.

Items and Response Format

The items were arranged in triads. The respondent indicated which he liked most and least among the three—a forced choice format.

Scores Available

There are 2 types of scales on the MVII, 21 occupational scales (all representing skilled trades) and 9 area scales representing 7 types of interests and 2 occupational settings (clean hands and outdoor). The occupational scales were developed by contrasting the patterns (configurations) of response to each triad of occupational group members with those of a Tradesmen-In-General group (N=250) made up of the representatives of 16 civilian occupations with none constituting more than 10 percent of the T-I-G group. The area or homogeneous scales were constructed by clustering items with no a priori rationale. The clusters were named after they were developed. The group utilized for this clustering is unspecified.

Norms

The occupational scales are normed on the occupational groups. The profile also graphically shows the range of scores for the middle third of the T-I-G group. The norms for the area scales are not specified. Since they are presented as standard scores, there must have been a norm group but what it was is a matter for speculation.

Score Interpretation

Similar to other inventories with empirically derived occupational scales and homogeneous scales based on clustering techniques.

How Scores Are Linked to Occupations

The occupational scales are linked to occupation through their mode of construction. The areas scales are not linked to occupations.

Recommendations

This inventory was reviewed because it shows that different technical, skilled occupations can be differentiated from each other using empirical technology. The item pool was developed specifically for that purpose. The manual shows that MVII scores are unrelated to measure of ability but is related to course grade in Naval Electronics Technician School. It also shows that interest scores differ for satisfied and unsatisfied yeomen.

Certainly this single sex inventory cannot be used directly but it does suggest a viable and tested model for differentiating among skilled workers. The configural scoring technique has been shown to contribute little to the efficiency of differentiation. Thus, a less complex scoring approach should be considered if this work is taken as a model.

Self Directed Search, Form R

Most Recent Revision Date

1994

Publisher

Psychological Assessment Resources

Forms

Form R (regular) is the fourth revision of the SDS. There is also a Form E (easy), which was written for students and adults with limited reading ability. Its second revision appeared in 1990. A CP (Career Planning) Form was developed for use in large organizations by deleting two sections and replacing items not relevant to individuals in the world of work. The SDS Career Explorer was developed to meet the needs of middle school and high school students. Form R is also available in a Spanish version (and others of less interest for Naval applications).

Reading Level

Not given

Medium of Presentation

The SDS is administered in paper and pencil format. It is self scored with directions for scoring contained in the test booklet. There are indications that the results can be influenced by mathematical errors. Form R can be administered and scored by computer and a narrative report can be produced as a result.

Length

No time estimates are given in the manual for completing Form R. However, it should take most respondents from 30–45 minutes to respond to the items. Self scoring and looking up occupations in the Occupations Finder (a listing of occupations organized by Holland type) would take longer.

Audience

High school and college students; adults

Items and Response Format

The first task on the SDS is to list up to eight occupational daydreams and find their occupational codes in the Occupations Finder. There are actually four sections that figure in the scoring of the inventory. In all of them the items are organized and presented by occupational theme based on the Holland typology. The first section is Activities (66 items, 11 per type). Responses available are Like and Dislike. The second section is Competencies (66 items, 11 per type). Responses available are Yes and No. The third is Occupations (84 items, 14 per type). Responses available are Yes and No indicating whether they interest or appeal to the respondent. This section contains the items Vocational Preference Inventory another instrument developed by Holland and published by PAR. The final section is Self-estimates. It offers 12 seven-point scales for competencies (two per Holland type). The format provides for self-scoring by overtly arranging the items in categories associated with Holland types.

Scores Available

The SDS results in scores for the six Holland types. They are based on adding the scores from the individual sections of the inventory. The three highest scores are the summary code for the individual.

Norms

As used by the individual the scores are not normed. However, the manual does present norms based for the summary codes and the separate sections based on 2600 individuals, including students and workers from a wide geographical area. The norms are presented by sex and level (high school, college, or adult). There is some ethnic diversity in the sample. The manual shows that ethnic differences are not great but that there are sex differences, particularly on the Realistic scale.

Score Interpretation

The summary code is used to enter the Occupations Finder where occupations are listed by Holland Code. In general, the codes in the Occupations Finder have been related to Dictionary of Occupational Titles occupations through discriminant analyses. Individuals are encouraged to consider and explore occupations representing all permutations of their three-letter code. Statistical indices are available for comparing individual codes with occupational codes as well.

How Scores Are Linked to Occupations

The linkage is through the above-mentioned analysis of occupations into Holland types.

Recommendations

The self-directed format is desirable for the individual but presents some problems for Naval application. The self-scoring process is time-consuming and possibly inaccurate. The range of occupations presented to the individual covers the whole range of occupations in the US and is probably too broad for the intended naval use of an interest inventory. The use of raw scores with their attendant sex differences has been the subject of heated and still not completely resolved debate over more than two decades. The format probably makes the inventory too transparent to be used in a personnel decision-making situation.

The Holland typology is probably an efficient way of classifying naval ratings. The number of scales is manageable in practical settings yet they produce documented differences among occupational groups. The use of several types of items in developing the Holland code is also desirable.

Strong Interest Inventory

Most Recent Revision Date

1994

Publisher

Consulting Psychologists Press, Palo Alto, CA

Forms

No alternatives, earlier revisions go back to the 1930s.

Reading Level

Eighth to ninth grade

Medium of Presentation

The SII can be administered in paper and pencil format or by computer.

Length

The SII's 317 items take most people about 30–45 minutes to complete.

Audience

High school students, college students, and adults.

There are 8 types of items on the SII. The first five sections (Occupations [135 items], School Subjects [39], Activities [46], Leisure Activities [29], Types of People [20]) utilize a “Like, Indifferent, Dislike” item response format. There are also two forced choice sections (Preference Between Activities [30 items] and Preference in the World of Work [6]) in which the respondent chooses between two alternatives or declares an equal preference. Between the two latter sections, is a section entitled Your Characteristics (12 items) to which the respondent may respond “yes or no.”

It is notable that the SII was originally devised to differentiate among professional level occupations. Many of the items reflect that orientation although items describing other levels of occupation and activity are also included.

Scores Available

The SII provides scores on 6 General Occupational Themes based on Holland's theory, on 25 Basic Interest Scales which are somewhat more specific than the GOTs, and on 211 Occupational Scales (204 of these represent 102 pairs of male and female scales for the same occupation) which are the most specific. It is worth noting that respondents are provided scores for all scales both male and female. In addition, there are four personal styles scales (Work Style, Learning Environment, Leadership Style, Risk Taking/Adventure) and five administrative indices, which give information about how the test was taken. It is worth noting that there is a BIS for Military Activities and an OS for Military Enlisted Personnel.

Norms

The OSs are normed on the occupational groups that were used to develop them. The GOTs and BISs are normed on the large male and female General Reference Samples, which are representative of the occupations sampled for the OSs.

Score Interpretation

GOTs and BISs are based on what the individual likes. They are interpreted as general indicators of types of interests. The OSs are based on both likes and dislikes and are interpreted as indicators of similarity or dissimilarity to individuals in specific occupations. Profiles use the Holland typology for organizing all three types of scores.

How Scores Are linked to occupations

The GOTs were developed to measure Holland's types and the BISs were developed earlier to measure more specific clusters of interests. Occupational groups generally score high on appropriate GOTs and BISs and low on inappropriate ones. The OSs are derived directly from the interests of individuals in specific occupations which differentiate them from the General Reference Sample.

Recommendation

The SII has several characteristics that would make it problematic for use with Navy Enlistees. First, the items contain references to jobs and activities at a somewhat higher level than those to which enlistees can aspire—it would lack face validity for them. Second, the occupational scale scores available also represent a number of higher level occupations. The non-professional occupations for which scales have been developed do not articulate well with Navy ratings. Third, the existence of different scales for men and women in most occupations sends a message that there are gendered activities within occupations even though the differences between the scales may be an artifact of the item selection procedure (comparing each occupational group with a gendered general reference sample). Finally, the specificity of the OSS raises the question of how many occupational scales are needed to represent the universe of occupations respondents might consider.

There are several positive aspects of the SII that might inform the process of measuring the interests of Naval enlistees or recruits. First, the GOTs and BISs are well developed and might be useful for Navy purposes. Second, the technology of differentiating occupations has been shown to be extremely effective, producing highly valid results. It might be adapted for development of a Navy inventory. The use of administrative indices, especially one that targets infrequent responses would be useful in a situation where respondents might be tempted to try to present themselves as highly desirable to the Navy.

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