Navy Personnel Research, Studies, and Technology Division
Bureau of Naval Personnel (NPRST/PERS-1)

Millington, TN 38055-1000 **NPRST-TN-06-8 September 2006**

Improving Person-Job Congruence During the Classification Process: Item Development and Initial Testing of a Pictorial Interest Instrument

William L. Farmer, Ph.D.
Stephen E. Watson, Ph.D.
David L. Alderton, Ph.D.
Navy Personnel Research, Studies, and Technology

Paul G. Michael, Ph.D.
Regina Hindelang, Ph.D.
The University of Memphis

NPRST
research at work

NPRST-TN-06-8
September 2006

Improving Person-Job Congruence During the Classification Process: Item Development and Initial Testing of a Pictorial Interest Instrument

William L. Farmer, Ph.D.
Stephen E. Watson, Ph.D.
David L. Alderton, Ph.D.
Navy Personnel Research, Studies, and Technology (NPRST)

Paul G. Michael, Ph.D.
Regina Hindelang, Ph.D.
The University of Memphis

Reviewed and Approved by
Jacqueline A. Mottern, Ph.D.
Institute for Selection and Classification

Released by
David L. Alderton, Ph.D.
Director

Navy Personnel Research, Studies, and Technology
Bureau of Naval Personnel
5720 Integrity Drive
Millington, TN 38055-1000
www.nprst.navy.mil

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
30-09-2006	Technical Report	1 Oct 2001 to 30 Sep 2003

4. TITLE AND SUBTITLE

Improving Person-Job Congruence During the Classification Process: Item Development and Initial Testing of a Pictorial Interest Instrument

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

William L. Farmer, Stephen E. Watson, David L. Alderton, Paul G. Michael, Regina Hindelang

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Navy Personnel Research, Studies, and Technology (NPRST/PERS-1)
Bureau of Naval Personnel
5720 Integrity Dr.
Millington, TN 38055-1000

8. PERFORMING ORGANIZATION REPORT NUMBER

NPRST-TN-06-8

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Office of Naval Research
800 North Quincy Street
Ballston Tower One
Arlington, VA 22217-5660

10. SPONSOR/MONITOR'S ACRONYM(S)

ONR

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

A - Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The current investigation centered on the design, development, and initial testing of a computer-administered pictorial interest inventory, called Job Opportunities in the Navy (previously known as Jobs and Occupational Interest in the Navy ([JOIN]). JOIN was designed to measure recruits' interest in various facets of Navy occupations. Ultimately, a validated version of JOIN would be implemented during the classification process, after selecting qualified applicants largely based on cognitive abilities. This study provided an examination of a computer-administered inventory that centers on the use of pictures as individual interest items. Content-valid and reliable pictorial items for an interest instrument were developed that represent various Navy work areas, work styles, work environments, and work activities. Furthermore, the descriptive statistical analyses of the JOIN items indicated that there was adequate dispersion of individual responses. In other words, the participants were different in their level of interest in various items. Finally, the results from the analysis of feedback items and discussion sessions suggest that incoming recruits possess the level of computer proficiency necessary to complete the inventory in a limited amount of time.

15. SUBJECT TERMS

rating, preference, interest, job preview, classification, job-matching, job-fit

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Genni Arledge
UNCLASS	UNCLASS	UNCLASS	UNCLASS	34	19b. TELEPHONE NUMBER *(Include area code)* 901-874-2115 (882)

Foreword

This report summarizes efforts to develop a rapidly configurable, pictorially presented, and web administered measure of vocational interest for entry level Navy enlisted jobs. This is an important component of our research program to overhaul and improve the Navy's enlisted selection and classification process. The program is designed to replace the current classification algorithm with a more flexible and accurate one, de-emphasize the almost exclusive focus on mental ability by including personality and interest measures in making classification decisions. Collectively, these efforts would transform and modernize enlisted classification by making it applicant-centric while improving job satisfaction and performance, reducing attrition, and increasing continuation behavior.

Over 70 years of vocational research has demonstrated that job assignments that are congruent with a person's interest and preferences, produce greater job satisfaction, increase performance, and lengthen tenure. The difficulty the Navy faces is that enlisted applicants have limited work experience and little knowledge of Navy jobs. To overcome this, the development focused on using pictures accompanied by small non-technical statements, items were differentiated based on broad job characteristics (e.g., industrial vs. office settings), and simple interest rating scales were utilized. The final product is a short and engaging instrument, based on a model of Navy enlisted work that can be easily modified. The output from the instrument is a rank-ordered list of preferences for all Navy entry-level jobs which can be used to augment classification decisions.

The research was sponsored by the Office of Navy Research (Code 34) and funded under PE 0602236N and PE 0603236N.

DAVID L. ALDERTON, Ph.D.
Director

Executive Summary

The current investigation centered on the design, development, and initial testing of a computer-administered pictorial interest inventory, called Job Opportunities in the Navy (formerly known as Jobs and Occupational Interest in the Navy [JOIN]). JOIN was designed to measure recruits' interest in various facets of Navy occupations. Ultimately, a validated version of JOIN would be implemented during the classification process, after selecting qualified applicants largely based on cognitive abilities.

The Navy's classification process occurs during a relatively short period of time, during which the individual and the organization must evaluate each other and an occupational choice must be made. During this process individuals are offered a wide variety of opportunities in a very broad range of jobs. Extensive vocational counseling literature attests to the benefits of matching an incumbent's interests to job requirements. What is more, the advantages may extend beyond those obtained from job classification based on pre-existing abilities and knowledge alone.

This study provided an examination of a computer-administered inventory that centers on the use of pictures as individual interest items. Content-valid and reliable pictorial items for an interest instrument were developed that represent various Navy work areas, work styles, work environments, and work activities. Furthermore, the descriptive statistical analyses of the JOIN items indicated that there was adequate dispersion of individual responses. In other words, the participants were different in their level of interest in various items. Finally, the results from the analysis of feedback items and discussion sessions suggest that incoming recruits possess the level of computer proficiency necessary to complete the inventory in a limited amount of time. In addition, recruits were typically positive in their evaluation of the quality of the computer-adapted inventory. Initial results suggest that recruits found the JOIN software to be a user-friendly interface.

The JOIN prototype software is in its initial phase of development, and, as such, the functionality of subsequent versions is potentially limitless. Future testing, however, will be conducted with a larger sample of new recruits to determine the inventory's criterion-related validity. Participants' interest responses will be analyzed and matched with relevant outcome data, such as attrition from training school and future job satisfaction.

Contents

List of Tables

Introduction

To meet their business purpose, most organizations must dedicate extensive time and effort to acquire and maintain a high-performance workforce. As the largest employers in America, the Armed Forces are certainly no exception to this requirement. A critical task for the Armed Forces is the selection of the appropriate personnel and their appropriate classification (i.e., job assignment) during initial processing (Schratz & Ree, 1989). Because of its role in our society, successful personnel selection and classification could be considered to be more important for the military than for any other organization, public or private.

With respect to the Navy, its principal goal is to maintain a viable defense organization consisting of hundreds of thousands of individuals who are well-qualified and well-trained (Kroeker, 1989). Every year thousands of young people, who have little prior training, volunteer for the Navy, and for many it is their first exposure to the world of work (Kroeker, 1989). In this context, effective personnel selection and classification is much more difficult in the military than in other organizations. Selection occurs when an organization chooses to accept or reject an applicant for eventual assignment to a job (Gatewood & Feild, 1998). This decision is made under legal and environmental constraints, and addresses the future interests of the organization. Information is systematically collected from applicants to determine how much job-related information and ability to perform job activities each possesses. Once an applicant has been selected, he or she must then be assigned to a particular job. The classification of qualified individuals is a much more complicated process and must exhibit flexibility. Optimal assignment, or matching the person to the job, is the lofty aim and ultimate achievement of successful selection and classification processes. A military organization's accessioning policy involves a complex system of goals and constraints that drives the assignment of a particular recruit to a particular job (Wiskoff & Rampton, 1989). The number of jobs available, the number of applicants, and the qualifications of applicants are also key parameters in determining actual assignments (Kroeker, 1989).

An optimal matching of persons and jobs is one that cannot be improved upon by any other allocation (Kroeker, 1989). Although there are many standards by which successful matching can be evaluated, one criterion often used is person-environment (P-E) fit, also referred to as person-organization (P-O) congruence. One form of P-E fit is the compatibility of individuals with specific jobs, or person-job (P-J) fit. Empirically, job performance, employee satisfaction, and retention are contingent upon appropriately matching personnel with their desired occupation (Bretz & Judge, 1994; Kristof, 1996; Tranberg, Slane, & Ekeberg, 1993). Today's military manpower and personnel managers require classification procedures that work effectively under a variety of conditions (Kroeker, 1989). The closer military managers can get to optimal assignment, the lower the costs (e.g., early attrition, reclassification, etc.) that will be associated with the process (Kristof, 1996; Schratz & Ree, 1989).

The Navy is cognizant of those factors that function to challenge the successful classification of qualified personnel, and it is attempting to meet the challenge in part by modifying existing personnel accessioning procedures and in part by developing new technological products (Baker & Ellis, 1989; Kroeker, 1989). The Navy's classification

process occurs during a relatively short period of time, during which the individual and the organization must evaluate each other and an occupational choice must be made. During this process individuals are offered a wide variety of opportunities in a very broad range of jobs (Kroeker, 1989). What further complicates this procedure is that most applicants know almost nothing about the Navy jobs (i.e., referred to as ratings) that are available. Not only is the Navy faced with the challenge of filling vacancies with the most qualified applicants, but it must also decide which job is best suited for the applicant while taking into consideration his or her career preferences.

Currently, a major impediment to successful assignment is the use of recruiting goals to drive accessioning policies (Navy Personnel Research, Studies, and Technology Department [NPRST], 1998). In general, the process results in a limited amount of information collected about an applicant's past behavior, personality, and interests. Navy researchers have proposed an agenda for defining manpower and personnel research in the future, which includes evaluating the benefits of a more "complete" personnel assessment beyond that of intelligence alone. Research initiatives include examining methods to improve the classification utility of existing aptitude measures as operational predictors (NPRST, 1998). This entails experimenting with alternative predictors, such as vocational interests, personality measures, and biographical data, that are not yet part of the operational ability measures (i.e., Armed Service Vocational Aptitude Battery [ASVAB]) and incorporating this predictor information into the classification process (Borman, Hedge, Ferstl, & Kaufman, 2002).

A necessary step to carry out the research agenda described above is to develop these alternative screening devices to aid in classification. The current investigation centers on the design, development, and initial testing of a computer-administered pictorial interest inventory, called Job Opportunities in the Navy (formerly known as Jobs and Occupational Interest in the Navy [JOIN]). JOIN was designed to measure recruits' interest in various facets of Navy occupations. Ultimately, a validated version of JOIN would be implemented during the classification process. After selecting qualified applicants largely based on cognitive abilities, interest measurement would be utilized to match people along a multitude of dimensions into the "best fitting" Navy job available. The challenge was to develop a flexible inventory that, by design, would assess applicant preferences and interest. Extensive vocational counseling literature attests to the benefits of matching an incumbent's interests to job requirements (Barak, 2001; Betz, 2001; Dawis, 1991). What is more, the advantages may extend beyond those obtained from job classification based on pre-existing abilities and knowledge alone (Borman et al., 2002). There is evidence to suggest that when a person is intellectually qualified for a host of jobs, the best assignment for long-term retention is the one that fits an individual's interests and not just the organization's manpower needs (Fitzgerald & Rounds, 1989; Hunter & Hunter, 1984; Karren & Graves, 1994; Savickas & Spokane, 1999).

The current project attempts to have its initial impact at the decision point where career counselors (i.e., classifiers) and applicants discuss job options and a job assignment is made. The ultimate goal is to demonstrate a difference between the quality of assignments actually made and potential improvements in assignments or the assignment process. In the future, this may be accomplished by examining various P-O fit indicators, such as recruits' satisfaction with the assignment process, training school

performance, attrition from training school, and reclassifications. The potential to account for incremental variance in these criteria, over that accounted for by ability measures alone, served as the impetus for this research project.

Person-Organization (P-O) Congruence

Person-Organization (P-O) congruence concerns the antecedents and consequences of compatibility between people and the organizations in which they work (Kristof, 1996). Congruence theory has dealt with broad issues of how the characteristics of the person and the organization's environment interact to affect well-being (Kulik, Oldham, & Hackman, 1987). Generally, conditions of fit between the person and the environment are predicted to result in high performance, satisfaction, and low stress (Borman et al., 2002; Karren & Graves, 1994; Kristof, 1996; Kulik et al., 1987). Researchers in this literature area often describe two broad, distinct types of P-O fit. First, it is conceptualized as a fit between the employees' needs and values and the opportunities provided by the organization in which they operate. A second conceptualization is as a fit between the demands of the organization and the abilities of the person to meet those demands (Kulik et al., 1987). One approach to, or conceptual model of, P-O fit is job characteristics theory, which emphasizes the importance of a fit between characteristics of the job and characteristics of the jobholder (Hackman & Oldham, 1976). This approach has also been referred to, and studied as person-job (P-J) fit or the compatibility of individuals with the specific tasks they are expected to perform (Kristof, 1996), or as the desires of a person and the attributes of a job (Edwards, 1991).

Research has shown that P-J fit is related to multiple organizationally relevant outcomes (Kristof, 1996), including work attitudes (e.g., Dawis & Lofquist, 1984), work performance (e.g., Murphy, 1993), and intention to quit or turnover (e.g., Bretz & Judge, 1994; Schneider, 1987). Although researchers have examined the effects of fit on several outcomes, most studies focus on positive outcomes for the individuals. For example, Bretz and Judge (1994) found powerful direct effects of P-O fit on organizational satisfaction. Specifically, they found these effects when P-O fit was conceptualized in various ways, such as the extent to which an individual's characteristics (i.e., knowledge, skills, abilities and other employee characteristics, KSAOs) met job requirements (i.e., indicative of P-J fit), and the degree to which individuals' values aligned with the organization's (i.e., value congruence). Various conceptualizations of P-J fit have also been found to be predictive of intentions to quit (Kristof, 1996). A vast compendium of research has suggested that individuals whose interests are incongruent with their jobs are more apt to leave their employing organizations than their congruent counterparts (Hellman, 1998; Jackofsky & Peters, 1983; Spencer & Steers, 1981; Spokane, 1985). Finally, self-report and more objective measures have been used to assess the effects of P-O fit on individuals' work performance. For example, Bretz and Judge (1994) investigated fit as a predictor of career success. Their results indicated indirect effects of P-O fit on job promotions and to a lesser extent salary level, in addition to direct effects on organizational tenure and satisfaction.

Researchers in various disciplines have addressed the need to develop techniques to accomplish sufficient P-O matching. However, the unique requirements and various practical and research problems encountered within each discipline shape the procedures developed to meet those problems. For example, within military classification, methodologies have been adapted to address special problems raised by enlistment procedures and by the sequential nature of military accessioning (Kroeker, 1989). Job options ranging from optimal to least acceptable must be identified rapidly for each potential recruit.

Although many studies indicate that fit influences individuals' preferences and organizations' selection and classification decisions, there is not a clear understanding of how specific procedures affect levels of P-O fit (Karren & Graves, 1994). For instance, strategies that strive to present realistic organizational previews may promote higher levels of fit than more general recruitment practices (Kristof, 1996). Moreover, it has been suggested that the greater the technical job requirements the greater the importance of P-J fit (Borman et al., 2002; Werbel & Gilliland, 1999). Because it may be difficult for Navy applicants to assess the available jobs in the organization, a particular effort must be made to increase their salience to applicants. Another relatively unexplored area regarding P-O fit is the improvement of fit assessments made during the selection and classification process (Werbel & Gilliland, 1999). Recruiters and career counselors who are able to clearly convey aspects of the organization may aid recruits in more accurately determining levels of P-J fit. Moreover, implementing interest assessment, personality tests, and other means of measuring non-cognitive characteristics may help to recognize applicant qualities that reflect a "good fit" with the organization (Kristof, 1996; Tziner, Meir, & Segal, 2002). Similar to realistic job previews (e.g., Rynes, 1991), using these methods to improve early fit assessments can save individual and organizational resources by improving screening mechanisms and individuals' self-selection out of particular occupations (Werbel & Gilliland, 1999).

The Navy has established programs of research to investigate and improve P-J fit through selection and assignment procedures (Borman et al., 2002). These programs include the recurrent investigation of the validity of the Armed Service Vocational Aptitude Battery (ASVAB) and its use (Foley & Rucker, 1989), and the development of new classification algorithms that optimize matching (Watson, 2002). Central to the topic of this research project, recent Navy initiatives have proposed the examination of the usefulness of individual interest assessment and other alternative employment predictors (Borman et al., 2002; Lightfoot, Alley, Schultz, & Watson, 2000; Lightfoot et al., 1999; NPRST, 1998).

For decades, the vocational counseling literature has made the convincing empirical argument that job selection based on stated preferences or "interests" may have a beneficial impact for the individual, in terms of job satisfaction (Betz, 2001; Borman et al., 2002; Dawis, 1991). Career decisions are among the most important decisions an individual must make (Gati, 1998). The career decision-making process consists of the prescreening of viable choices, an in-depth exploration of the most promising alternatives, and ranking these alternatives. The ultimate goal of this process is to maximize P-O fit (Gati & Asher, 2001; Holland, 1985; Lofquist & Dawis, 1984, 1991). Again, the P-O perspective assumes that congruence between an individual's interests

and the characteristics of his or her chosen occupation results in positive outcomes for the individual as well as the organization (Dawis & Lofquist, 1984; Holland, 1985; Spokane, 1985). Advances in the last decade have shown that we can reliably measure the interest facet of human behavior and that under certain conditions these can add substantially to our ability to predict relevant outcomes (Borman et al., 2002; Savickas, 1999).

Vocational Interest Measurement

For almost a century, industry has recognized the financial worth of having a person interested in his or her job. Psychologists in the 1920s began to explore the possibility of interest measurement as an attempt to supplement existing measures of special and general abilities (Hansen, 1994; Hunter & Hunter, 1984; Roe & Seligman, 1964). There have been numerous studies investigating the nature of vocational interests and, in particular, developing inventories to measure those interests (e.g., Strong, 1955; Super, 1949).

Common paper-and-pencil interest measures include the Strong Vocational Interest Blank and its various revisions (SVIB, Hansen & Campbell, 1985; Harmon, Hansen, Borgen, & Hammer, 1994), the Kuder Occupational Interest Survey (KOIS; Kuder, 1964; Kuder & Zytowski, 1991), and the Self-Directed Search (SDS; Holland, Powell, & Fristsche, 1994). Vocational interest inventories such as these require an applicant to indicate his or her preference (e.g., like, indifferent, or dislike) for a variety of activities or job titles. For some time, such inventories have been the tool that industry has effectively utilized for job placement of prospective employees (Hansen, 1994).

Over the last 70 years of interest measurement, there have been 3 prominent strategies employed in the development of interest scales (Burisch, 1984). One of these methods, the external approach, is based on the premise that people can be sorted into groups. This method of scale development involves contrasting item responses of an occupational sample with those of a general group. Early interest scales were empirically derived, heterogeneous scales composed of items that separated workers in specific occupational groups (Harmon, 1999). Scales developed using this approach are difficult to fake, and are very efficient for predicting membership in specific occupations. However, this approach typically produces longer scales, that take longer to administer, and subsequently are more costly. The internal approach to scale development involves developing homogenous scales from a large number of interest items using some type of clustering technique (Harmon, 1999). A structural analysis of item response data, such as factor analysis, is performed to identify the underlying independent dimensions of vocational interest. A major advantage of this strategy is that the meaning of scale scores is easy to communicate to clients, because typically, the label of the scale indicates the content and definition of the scale (Savickas, 1999). Moreover, the derived scales are relatively independent, thus they can be used to predict occupational membership. One final approach, the rational approach to interest measurement, is based on the idea that a theory or model of vocational interests should influence the choice and definition of constructs (or scales), and precede the development of the items (Betz, 2001). Studies examining these three strategies for vocational interest scale construction have shown

that they produce equally valid scales (Betz, 2001; Burisch, 1984). Preference for employing one or more of these approaches is typically based on other criteria such as assessment purpose, economics, etc. (Lightfoot et al., 1999).

These and other strategies have been employed by scientists and have resulted in dozens, if not hundreds, of vocational interest inventories. These instruments vary widely in sophistication, extent of use, and psychometric quality. For today's Navy it seems that the most appropriate approach to interest measurement, based on past research and current objectives, would be a blend of the external and internal strategies (Lightfoot et al., 1999). Prior to this research project, several steps had been taken to incorporate interest measurement in the Navy's classification system.

Previous researchers evaluated existing interest inventories for Navy use (Lightfoot et al., 1999), and consequently the lack of suitable alternatives prompted other Navy researchers to develop a rather exhaustive vocational interest inventory (Lightfoot et al., 2000). This inventory was deemed objectionable for several reasons, the most salient of which was the overwhelming number of items (i.e., more than 500 activity statements). During Navy classification each recruit must undergo a battery of aptitude and medical tests, as well as other administrative procedures, which, in aggregate, make the administration of an exhaustive inventory, within such a limited period of time, problematic. Thus, in designing the inventory for the current study, one focus was the number of items the instrument contained. It was determined that the optimal vocational interest inventory for Navy recruits would include a minimal number of items while maintaining an appreciable degree of predictive utility.

In addition, the optimal inventory would be required to meet several guidelines to better incorporate the instrument in the classification system. For example, the inventory should adequately discriminate among ratings for the purpose of person-job matching and add to the predictive effectiveness of ability measures alone. Researchers have suggested that 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 (Lightfoot et al., 1999). One additional focus of this project was to adequately inform applicants about the specific nature of Navy work using text and pictures. In describing the Navy world-of-work, written tests, as those mentioned above require a certain amount of reading comprehension and verbal ability on the part of the individual completing the inventory. This may be a cause for concern as to the value of these paper-and-pencil tests in the assessment of interests of those individuals who possess comparatively low mental ability or insufficient reading skills. As one solution to this problem, the current research paper centers on the development of an interest inventory that utilizes a large number of digital images to comprise individual interest items. There is some evidence that pictorial presentation has an advantage over the usual verbal measures when used with certain individuals who may tend to misconstrue the meaning of printed statements; such as those with limited schooling, inferior reading ability, or cultural disadvantage (Jastak & Jastak, 1970). This mode of interest assessment was also chosen so as to provide those applicants with little prior knowledge of Navy jobs an extensive amount of information beyond that of written items alone. Finally, the inventory needs to be based on a flexible model that may be

readily altered as the organization and specific jobs change. Currently, there are no inventories, including those previously developed for the Navy, that meet all of the aforementioned design criteria.

Interest measurement has been employed in selection and classification with the goal of maximizing predictions of success, satisfaction, and persistence in training as well as on the job (Hansen, 1994). There is a strong belief in the literature that interests or preferences should predict the choice, selection, and attainment of success in particular activities by an individual (Barak, 1981). Largely, the use of interest measures in the context of selection and classification is based on the assumption that knowing a person's motivation or the manner in which an individual responds to a variety of situations can help predict success in a job (Vroom, 1964). The idea that vocational satisfaction is related to the degree of fit or congruence between the attributes of an individual and the work environment is central to the field of vocational counseling (Tranberg et al., 1993). It is generally recognized that work-relevant abilities (e.g., technical aptitude), interests, and values are primary considerations when helping persons with career exploration (Barak, 2001; Betz, 2001). Work-relevant abilities include non-cognitive abilities in addition to the customary cognitive abilities (Mumford, Peterson, & Childs, 1999). Interest assessment would make an important contribution to any placement or selection procedure when one considers the large number of young people who are undecided in their career goals and who typically have little knowledge regarding specific occupations (Hansen, 1994). Finally, the assessment of interests would reduce the necessity of the individuals knowing specific tasks involved in various occupations (Wilbourn & Alley, 1978).

Selection and Classification Programs

The purpose of a selection program is to identify the best individuals to perform a job within the organization. Gathering information about the job in the organization, or job analysis, is the logical starting point in the development of such a program (Gatewood & Feild, 1998). This information typically describes the environment, the work activities, and the outcomes that characterize the job. This information is essential to selection and classification programs for several reasons. First, this information conveys to potential applicants information about the nature and demands of the job (Schippmann, 1999). Second, this information is also important because it indicates what constitutes successful job performance (Schippmann, 1999). Finally, this information allows organizations to identify the knowledge, skills, abilities, and other employee characteristics (KSAOs) that a worker should possess in order to perform the job successfully (Gatewood & Feild, 1998). In general, where selection is concerned, organizations are by and large interested in abilities, which become the basic characteristics to be evaluated in applicants (Gatewood & Feild, 1998).

The assumption in selection is that applicants possess different amounts of job-related abilities (i.e., KSAOs) necessary for successful performance. The purpose of assessment is to measure these differences, and it is in this way that promising applicants can be distinguished from unqualified applicants. On the other hand, the crucial challenge in classification is maintaining assignment procedures so that a close

match between human skills and job requirements is achieved (Kroeker, 1989). When classification is done poorly, the consequences are more costly and complex. For example, with regard to the Navy training school, attrition may be elevated and school seats underutilized. Moreover, after training poor incumbent performance may affect readiness and job satisfaction, substantially reducing retention rates. During job assignment it may be useful to facilitate the matching process by examining other employee characteristics, such as an applicant's job interests or work preferences, in addition to cognitive abilities (Borman et al., 2002; Hunter & Hunter, 1984; NPRST, 1998).

Ordinarily the first activity in the Navy's selection process is the recruiter interview, during which preliminary testing is conducted with each applicant to identify and remove those not suited for the service. This screening process includes a determination of applicant citizenship status, education level, moral character, general physical condition, and the administration of the Enlistment Screening Test (EST) to pre-screen prospects on verbal and mathematical ability (Foley & Rucker, 1989). Next, qualified applicants move on to the Military Entrance Processing Station (MEPS), or a test site where full-scale enlistment processing is accomplished (e.g., medical examination, counseling, and work assignment). At the MEPS applicants are given a more stringent screening measure, the Armed Services Vocational Aptitude Battery (ASVAB). The ASVAB consists of a battery of tests covering four content domains: verbal, numerical, technical, and perceptual speed (NPRST, 1998). By adding scores across tests the applicant is qualified for service, assigned to a technical school, and enlisted into a Navy career; all in roughly three hours (NPRST, 1998; Schratz & Ree, 1989).

Subsequent to those screening activities pertinent to selection, all the services address the issue of classification into an occupational area or a specific job. Typically, the actual assignment of recruits to training schools, and thus jobs, is accomplished via computerized person-job match algorithms. Each service has its own algorithm, which reflects its current policies toward the relative priorities of filling jobs at any point in time (Kroeker, 1989).

Classification efforts are optimized when jobs are examined for specific requirements, and certain individual characteristics are assessed to ascertain if the person-job match would be maximized (NPRST, 1998). All of the classification algorithms used by the individual services adhere to a minimum aptitude standard for each job, and all are designed to maximize the utilization of training school vacancies across jobs (Kroeker, 1989). The benefits of including intellectual measures (e.g., the ASVAB) for both selection and classification decisions are undeniable (Hunter & Hunter, 1984). The benefits for the organization include reduced training failures and training costs, and greater performance and productivity. For the individual, the benefits include a greater probability of success in training and on-the-job performance.

A second characteristic that may be evaluated to maximize P-J fit is an individual's vocational interest. Again, both the organization and the individual (e.g., increased job satisfaction) would stand to benefit from classification decisions based in some part on interests (Borman et al., 2002). Since the move to an all-volunteer force, occupational preference has assumed a larger role in military classification (Schratz & Ree, 1989).

Individuals' preferences have to be considered, to some degree, in job assignments. Relative to other branches of service (i.e., Air Force and Army), the Navy makes a weak attempt to include preference scores in their assignment system.

Currently, this minimal effort to assess preference consists of providing the applicant with a list of jobs or broader occupational groups (e.g., administration, health care, ordnance, etc.) and, in some cases, with laminated job cards displaying limited amounts of information regarding possible occupations (Russell, Knapp, & Campbell, 1992). Some of the individuals are afforded the time available during processing to review this information, and then they are asked to indicate their top five occupational group preferences (Russell et al., 1992). In other cases, the classifier may indicate irrelevant preferences so that the remainder of the computerized accessioning procedure can be completed. A reasonable assumption is that the current methods used to determine preference lack structure, are insufficient, and may not lead to reliable or accurate preference data. In many cases job selection is made with little knowledge of actual job content, which may lead to dissatisfaction in the selected career. Even when job descriptions are available, the technical wording of the descriptions may render them useless for enlistees with limited reading abilities (Bartol, 1981).

The Navy is continuously faced with constraints that limit the usefulness of optimal classification strategies. In all organizations the work assignment methods must operate under one or more constraints, such as budget limitations, training seat availability, group goals, management priorities, and applicant preferences (Kroeker, 1989). Generally, the existence of constraints reduces potential gains from classification. In an attempt to address the Navy's deficiencies in its classification process, Navy researchers have worked with other contributors to develop and test new classification decision support software, the Rating Identification Engine (RIDE), which provides classification algorithms for enlisted personnel. The goal behind the new system is to improve the recruit-rating assignment process so that it provides greater utility in the operational classification system (Watson, 2002). The assignment system utilizes an algorithm comprised of several components, such as cognitive ability, predicted training success, job priority, and probability of attrition. The system then generates a number reflecting the value of assigning the recruit to each rating (e.g., such as Machinist's Mate [MM]). Navy ratings with no openings, or for which the applicant is not qualified are eliminated, and the remaining jobs are ranked accordingly.

To meet future manpower requirements, the Navy envisions using RIDE to first identify appropriate jobs for an individual applicant (NPRST, 1998). Then, an interest inventory (i.e., JOIN) would be utilized to filter those jobs in which a person is likely to be interested. It is purported that the simultaneous use of an interest measure and the RIDE system will improve the match between the recruit's abilities and interests, and his or her assigned rating. This procedure would enable applicants and classifiers to discuss job options and make a final decision about enlistment in the brief time frame allotted. Ultimately, this system should serve as a means of increasing job satisfaction, performance, and retention (Watson, 2002).

Abilities and Interests

The field of psychology has provided many of the tools (e.g., tests) that serve as a critical element in the selection and classification process (Schratz & Ree, 1989). Aptitude or ability tests are used to measure how well an individual can perform specific parts of a job (Gatewood & Feild, 1998). Additionally, ability tests are differentiated by the nature of the content they measure (e.g., specific vs. general) and the breadth of topics covered (e.g., intellectual, mechanical, spatial, perceptual, motor, etc.).

Many of the research paradigms in ability testing focus on improving the prediction of the outcomes of both education (or training) and job performance (Dillon, 1989). Research in military, as well as civilian organizations has shown that a lack of qualifications can lead to training failures and poor job performance. For example, a high school diploma has been shown to be the best single predictor of adaptability to military life (Foley & Rucker, 1989). The first organized testing program of mental ability was developed in response to the need to assess a large number of men for the military mobilization of World War I (WWI). From that point forward the military has been at the forefront of psychological testing (Schratz & Ree, 1989). One of the earliest mental ability, or intelligence tests, was developed in 1917 to provide scores that could be used to reject recruits who were thought to be unfit for military service during WWI (Gatewood & Feild, 1998). It was called the Army Alpha and over one million men were tested across the United States. The use of this test generated interest in the development of other ability tests for use in vocational counseling and industrial selection. Furthermore, during World War II all three military organizations had extensive psychological testing programs that emphasized developing specialized tests to assist in placing recruits in the most appropriate jobs (Gatewood & Field, 1998).

The Armed Services Vocational Aptitude Battery (ASVAB) was introduced by the Department of Defense (DOD) in 1968 and later adopted by the Navy, and all other military branches, for selecting enlistees and classifying them into military occupations (Foley & Rucker, 1989). Up to January 2002, the ASVAB was comprised of a number of subtests that include arithmetic reasoning, auto and shop information, coding speed, electronics information, general science, mathematics knowledge, mechanical comprehension, numerical operations, paragraph comprehension, and word knowledge. After January 2002, the ASVAB was updated to remove the numerical operations and coding speed subtests and add an assembling objects subtest. The ASVAB is regularly updated, approximately every four years, in order to increase the security of the test items, to allow for the replacement of obsolete test items, and to incorporate improvements in the field of measurement into the new tests. Classification of Navy recruits is accomplished by using 11 composites of ASVAB subtests that predict success in the associated initial occupational training school (Foley & Rucker, 1989). Assessment of the ASVAB has been conducted by a number of researchers over the test's history (Foley & Rucker, 1989).

Although the ASVAB has oft been referenced as an exemplary psychometric instrument throughout the years, it has not been without criticism. Several researchers have suggested that the ASVAB has several less than desirable characteristics. For example, Jensen (1985) criticized the lack of differential validity for the ASVAB subtests. Essentially, the composites formed are highly inter-correlated, suggesting that each

subtest does not account for some unique proportion of the variance. Moreover, Jensen suggested that the instrument is of limited utility with regard to assisting individuals in choosing between competing job alternatives. Similarly, Murphy (1984) commented on the high inter-correlations between composite scores, and the inadequacy of the instrument in providing the type of information that would allow classifiers to differentiate among vocational aptitudes and place recruits in the most suitable schools/service careers.

Purpose and Objectives

The purpose of the current study was to develop and test pictorial items for an interest instrument that could easily be implemented into the Navy's current classification process, and be used with the RIDE system. The challenge was to develop a flexible computer-administered inventory that, by design, would assess applicant preferences and interest. Specific considerations were the inventory's length (i.e., time taken to administer), the ability to easily alter its content as Navy jobs changed, and its ability to be used by naive applicants. Additionally, the inventory would not only measure an applicant's interest in different dimensions of Navy enlisted jobs but also inform the applicant regarding the Navy's world-of-work.

The first objective was to collect job-related information concerning each enlisted job in order to develop a model (or structure) to serve as the basis for individual interest items. One goal was to identify the work activities, work styles, and work environments that are most generic, and as such, would likely be applicable to multiple ratings while maintaining an accurate description of each of the analyzed ratings. Another objective, relative to the first, was to develop pictorial interest items that represent each of the previously mentioned dimensions of Navy jobs. Job analysis data collected from subject matter experts (SMEs) were analyzed to examine the structure of the model driving the instrument and the content of the inventory items. The aim was to develop an interest structure that was unique in that the items distinguished among different ratings, but also general enough so that traditional clusters of Navy jobs resembling existing occupational groups could be formed.

Following instrument development, the next objective was to gather responses from a group of new recruits, during basic training, to evaluate the psychometric properties of the pictorial items and content of the computer-administered instrument. Assessment of the instrument was conducted on the item level as well as at the scale level. The aim was to develop individual items that would elicit adequate variance in participants' responses and adequate internal consistency reliability, across and within individual items. Exploratory factor analyses of participants' responses were conducted to determine the potential grouping of items into interpretable scales. Additional analyses were also performed to investigate if any differences existed in participants' interests when gender and race were used as grouping variables.

One final objective was the evaluation of the usability of the computer-administered instrument using recruits to determine the programs functionality under certain organizational constraints (e.g., available test time, recruit characteristics). In part, the information collected was used to verify that recruits possess the skills necessary to

complete the alternative mode of administration in an acceptable amount of time. Furthermore, this information provided the opportunity to collect general feedback, ratings regarding the instruments usability (e.g., ease of use, clarity of instructions, etc.), and opinions regarding the general appeal of the device (e.g., visual appeal, comparison to a paper-and-pencil format, etc.).

Aside from the obvious advantage to the Navy of such an instrument, the current study contributes to the existing vocational interest literature in several ways. First, this study provides an examination of a computer-administered inventory that centers on the use of pictures as individual interest items. Several authors have expressed the need to further explore and utilize non-traditional administration methods, as well as non-conventional items to assess interests (Lent, 2001; Russell, 2001; Savickas, 2001). Furthermore, this study corresponds to the vision that has been expressed in the field of vocational psychology to renew linkages with industrial-organizational psychology (Gottfredson, 2001). Specifically, this research effort merges the study of vocational interests and developments in job analysis, personnel selection, and classification.

Method

Phase I: Instrument Development

The premise leading to the development of an interest model and inventory items was based in part on the recommendations offered in several preliminary reports (Lightfoot et al., 2000; Lightfoot et al., 1999; Watson, Hindelang, & Michael, 2002). In particular, Watson and his colleagues (2002) suggested the design criteria that guided the current research project and first identified the inventory as Jobs and Occupational Interest in the Navy (JOIN).

Model Development

The development of the JOIN interest model began with the examination of Navy jobs guided by a basic hierarchical model of work developed by Schippmann (1999). According to the proposed framework, at the macro-level, the organization (i.e., the Navy) consists of various job families or a grouping of jobs that are categorized according to organizational function or work process (e.g., aviation area, health care area, etc.). The world of Navy work can also be examined at a micro level, in terms of those work activities or tasks describing work performed, which are subsumed under a superordinate job family. A variation on basic job analytic methods was utilized to collect these organizational data.

The first step involved the collection of all of the available enlisted job descriptions from several Navy resources; such as the U.S. Navy homepage, Navy Personnel Command homepage, and job information cards. Each job description was reviewed and words that reflected basic work dimensions were highlighted. Specific components included community areas, work styles, work environments, and work activity statements. From these highlighted extracts, preliminary items were created that

seemed most representative of each of the 79 Navy enlisted ratings. With regards to work activities, these statements were further reduced to two components, a process (e.g., verbs such as analyze, maintain, operate) and a specific content (e.g., nouns such as documents, mechanical equipment, weapons, etc.). The purpose in defining job tasks as process-content (PC) pairs was threefold. First, it would allow very specific activities to be more easily conveyed to naive recruits who may not have an understanding of the detailed content. For example, many job tasks involve the use of equipment or machinery that is not common knowledge; such as pneumatic devices, launch recovery craft, etc. By using broader terms to describe such devices a more precise level of interest in the activities could be assessed. Second, describing work activities in this manner would allow for a reduction in the total number of items needed. For example, a large number of activities may include similar types of equipment (e.g., hydraulics, pneumatics, steam powered, etc.), and thus could be subsumed under one category (e.g., mechanical equipment). Finally, as Navy jobs change and the tasks within those jobs change, the inventory items could be revised without much difficulty. For example, subsequent large-scale validation of the new items would not have to be conducted. Rather subject matter experts (SMEs) could be utilized to judge new tasks and place them in the appropriate PC pair categories. These job activities would serve as the core items in the inventory. For example, some of the activities created included: repair mechanical equipment, analyze documents, direct aircraft, make facilities, etc. The primary focus in the initial phase of model development was to construct PC pairs that would discriminate across a variety of Navy ratings.

The lists of community areas, work styles, work environments, and work activities were then judged and revised by SMEs over multiple feedback and interview sessions. Approximately 15 of the enlisted community managers (ECMs), who manage the enlisted Navy jobs, served as the key group of experts. At the outset of the project a total of 45 work activities were specified. Through numerous discussions it was determined that a reduction in the number of job tasks was warranted, and ultimately 19 activities were eliminated. These efforts resulted in a list of 8 community areas, 4 work styles, 4 environments, and 26 work activities (see Appendix A). An abbreviated job analytic procedure was utilized to link specific jobs to the items in these lists, creating a 79 by 41 matrix. The SMEs were asked to indicate each pertinent community area, work style, environment, and work activity, in the ratings they manage. Each ECM indicated roughly five activities that were considered to be important or critical job tasks performed in the rating. Ultimately, these data formed the model structure that linked the 79 individual enlisted Navy jobs with each item under the 4 work dimensions (see Appendix B). Interest profiles comprised of the related dimensional qualities (i.e., items) could then be created for each job. For example, job analysis data revealed that the rating Hospital Corpsman (HM) should be linked to the health care community, physical work, office environment, analyze documents, respond to emergencies, serve customers, etc.

Pictorial Item Development

The development of JOIN items was an iterative process. After collecting the core content for the interest inventory, the next phase of the project involved the identification of images that were representative of each of the previously identified work dimensions. Again, the decision to supplement a conventional instrument format (e.g., only textual descriptors) with digital images was based on the assumption that applicants have little prior knowledge about the range of tasks that are performed in Navy jobs. Based on this premise, it was thought that the provision of pictures, in conjunction with behavioral descriptions of activities, would lend itself to an increased understanding among applicants of what to expect, thereby measuring a truer level of their interest. One of the challenges was to incorporate pictures of enlisted personnel performing job tasks that met multiple criteria. In order to be selected for inclusion, the digital image (1) needed to be representative of both routine and non-routine job tasks, (2) displayed tasks being performed in various community areas, as well as in assorted contextual work environments, and (3) needed to display both gender and racial diversity.

Various resources were utilized to obtain pictures of Navy enlisted personnel performing various work-related tasks. Specifically, a large number of digital images were available on several Navy internet websites. In addition, there are several organizational departments within the Navy (e.g., Navy Recruiting Command) that regularly photograph the personnel out in the fleet and provide these images upon request. The main objective was to identify and categorize photographs into an appropriate work activity so that they could be used in the interest inventory. Over 500 pictures were collected that were considered to be pictorially representative of any one of the previously identified activities and other work dimensions (e.g., aviation, outdoor environment, etc.). The images were then judged by two groups of SMEs during multiple interview sessions. The main purpose of the interview sessions was to validate the content of the collected images. The goal was to have participants categorize each picture and at the same time identify any missing work activities that were not suggested during previous SME interview sessions. Participants were shown, in random order, a numbered photo and then asked to identify the work activity that the picture best represented. If the picture could be associated with more than one activity, the SMEs were asked to rank order their choices for that image. The multiple feedback sessions resulted in the verification of the more than 300 images now contained within JOIN.

It was determined that each time a work dimension item was presented it would be accompanied by three to four pictures representing that item. This was done so that various examples subsumed under an individual item could be represented. For example, when maintain mechanical equipment was presented the three pictures displayed would contain different types of mechanical equipment that ordinarily would be expressed using multiple inventory items. Furthermore, in an effort to obtain reliability measures on the pictorial work activity items, it was established that JOIN would present applicants with each of the 26 items 3 times during the inventory (i.e., 78 work activity items). Based on applicant feedback and additional reliability testing, the number of presentations to applicants was reduced from three to one.

Computer-Administered Inventory Development

Throughout the content development and image identification phase of the project, the researcher, in conjunction with computer programmers, focused on the development of a computer-administered vocational interest inventory. The collaborative effort resulted in the development of the JOIN experimental software. The JOIN prototype software was designed to provide recruits a realistic portrayal of the components of actual Navy ratings (i.e., realistic job previews), and to assess their interest in four broad dimensions of work associated with these jobs. This was accomplished by employing a series of digital images of Sailors performing job tasks in various job contexts.

The first section of the inventory, Navy community areas, consists of eight areas each represented by four pictures (see Appendix C). Respondents are asked to indicate their preference (e.g., very interested, neutral, not interested) using a 5-point Likert scale. The second dimension contains four items identifying different work styles (e.g., work with a team), and the third dimension contains four items identifying different work environments (e.g., work outdoor). Participants are asked to indicate their level of preference for working in the various contextual conditions, each represented by three pictures. The final dimension, work activities, includes 26 work activity items. Each activity serves as an individual interest item that allows participants to indicate their level of interest in the activity presented (e.g., maintain mechanical equipment). Participants are presented with three pictures and descriptive text for each item, and again use the aforementioned response scale (see Appendix D).

Phase II: Instrument Testing

Participants and Setting

Data were collected over a period of three days, during which time three to four recruit divisions were processed per day. A total of 300 new recruits participated in the initial testing phase. The number of recruits participating in usability testing per day ranged from 67 to 118 (day 3 and day 2 respectively). The medical and dental processing facility, located on the Naval Training Center (NTC) Great Lakes campus, served as the test site. Participants were asked to voluntarily participate in the instrument's testing as they completed a number of processing stages. Random selection and assignment were not feasible due to the imposition of constraints related to limited time availability during the medical and dental processing phase. Efforts were made, however, to select a representative sample of minorities (e.g., females and minority races). In addition, the participants were tested on either their third or fifth day of basic training so as to obtain a sample that would generalize to those future recruits who would be using the instrument once made operational (i.e., naive applicants that would not have a lot of knowledge regarding the Navy).

Descriptive statistics indicated that 45 enlisted jobs or training programs (e.g., Hospital Corpsman [HM]) were represented within the sample of participants (see Table 1). Approximately 72 percent of respondents were male. Respondents ranged in

age from 17 to 32 years, with a mean age of 19 years. In terms of race or ethnicity, the sample was 59 percent Caucasian, 21 percent African American, 13 percent Hispanic American, and 2 percent Asian Pacific Islander. Approximately 7 percent of those surveyed indicated that they were members of a race "other" than those mentioned above. The proportion of female and other minority participants was found to be representative of the current Navy population of enlisted personnel (U.S. Navy, 2001).

Table 1
Recruit sample characteristics

	N	%	M	SD
Age	290	--	18.90	2.11
Gender	290	--	--	--
Female	82	28.3	--	--
Male	208	71.7	--	--
Ethnicity	262	--	--	--
Asian-Pacific Islander	4	1.5	--	--
African American	54	20.6	--	--
Caucasian	154	58.8	--	--
Hispanic American	33	12.6	--	--
Other	17	6.5	--	--
Computer Skills	288	--	3.89	0.90
1 (not experienced)	6	2.1	--	--
2	13	4.5	--	--
3	58	20.1	--	--
4	141	49.0	--	--
5 (very experienced)	70	24.3	--	--
Computer Hours	270	--	17.64	22.86

*Percentages reported are valid percents.

Procedure

In an effort to provide a "first look" at new recruits' opinions of the instrument, JOIN was administered to a group of naive applicants as they waited in the medical processing facility. Participants were asked to voluntarily participate in the instrument testing as they completed a number of processing stages. Sixteen computer stations (i.e., a table, laptop, and bench) were used at any given time, with five to six participants seated around one of three tables set up in a large processing area. Participants were asked to complete JOIN and provide feedback regarding the software. Before beginning each session, the recruits were told that they could stop at any time and their participation

would in no way affect their current or future Navy career. After completing JOIN feedback data were collected from participants in two ways. All participants were asked if they would complete an optional feedback sheet (see Appendix E). In addition, approximately 11 informal discussion groups were conducted over the 3-day testing period. The discussion groups were asked many of the same questions that were included on the feedback sheet. Additional questions, however, were added daily as needed and based on the results of the previous test day. Completing the entire procedure took participants an average of 40 minutes, and responding to only the JOIN inventory an average of 24 minutes.

Results

Model Analysis

The first objective was to design a model that would distinguish among the different Navy enlisted ratings. The data collected from the SMEs during the developmental interview sessions were analyzed to determine the uniqueness of the PC pairs and how well they cover Navy jobs. Due to the nature of the SME data, a principal components analysis was employed in order to analyze the binary data that linked each item to each job. In other words, the procedure determined how similar or dissimilar particular jobs were from one another based on the inclusion or exclusion of a particular work activity. A principal components analysis of the model's structure was conducted and indicated that a 9-component solution with varimax rotation provided the best description of the data. The 9-component solution accounted for 89 percent of the variance among the enlisted jobs. A loading of 0.40 was the criterion established for interpreting the item composition of the nine components. The resulting factors that were extracted seem to fit very well with pre-established Navy occupational groups. This initial inquiry into the grouping of Navy ratings, based upon their inherent work activity structure seems to converge with previous factor analytic results conducted on Navy jobs. For example, the Navy currently categorizes jobs into 14 occupational groups, such as Administration, Mechanical, Electrical, Health Care, etc. The factor analysis revealed that the enlisted ratings were grouped in a similar fashion based on corresponding items (e.g., work activity). The components extracted were interpreted as Electronic, Mechanical, Administrative, Mass communication, Construction, Intelligence, and Weapons Activities.

Item Analyses

The next objective was to gather responses from a group of new recruits during basic training to evaluate the psychometric properties of the pictorial items and content of the computer-administered instrument. The items included in each dimension (i.e., community areas, work styles-environments, and work activities) were subjected to various analyses. Descriptive analyses were performed on all items to determine if there is adequate variance in the participants' responses. Furthermore, assessment of the work activity items took place on the individual item level as well as at the scale level.

Community Areas

Participants were asked to rank order the seven Navy community areas based on level of interest. While respondents were required to indicate at least one area they were interested in, ranking every community area was not compulsory. The results of descriptive statistical analyses suggested that aviation was the most highly sought after community. More recruits ranked the aviation community as their first choice than any other community area (33%). Eighteen percent of the participants indicated that they were most interested in special programs, whereas the health care and intelligence communities were each ranked as the top choice by 14 percent of the recruits (i.e., 14% and 14%, respectively). The submarine community was seemingly least preferred among the Navy communities; nearly half (49%) of the participants indicated that they were not interested in this community. Upon examination, the results indicated that the community area dimension elicited varied responses across participants. Specifically, with the exception of the aviation and special programs community areas, the other areas appear to demonstrate equal dispersion across the ranked positions. In other words, a relatively equal number of participants ranked these communities as their first, second, third, fourth, fifth, sixth, and seventh choices (see Table 2).

Table 2
Navy community area item response distribution

	Rank							
	More Interesting						**Less Interesting**	**Not Interesting**
	1	2	3	4	5	6	7	(unranked)
Aviation								
N	94	45	39	17	13	5	4	70
%	32.8	15.7	13.6	5.9	4.5	1.7	1.4	24.4
Construction								
N	24	26	21	17	14	22	34	129
%	8.4	9.1	7.3	5.9	4.9	7.7	11.8	44.9
Health care								
N	41	27	15	18	9	24	23	130
%	14.3	9.4	5.2	6.3	3.1	8.4	8.0	45.3
Intelligence								
N	43	42	40	31	19	6	6	100
%	15.0	14.6	13.9	10.8	6.6	2.1	2.1	34.8
Submarine								
N	15	14	31	19	25	26	16	141
%	5.2	4.9	10.8	6.6	8.7	9.1	5.6	49.1

Table 2
Navy community area item response distribution

	Rank							
	More Interesting						Less Interesting	Not Interesting
Surface								
N	20	40	44	45	22	15	12	89
%	7.0	13.9	15.3	15.7	7.7	5.2	4.2	31.0
Special Programs								
N	51	81	39	19	19	4	4	70
%	17.8	28.2	13.6	6.6	6.6	1.4	1.4	24.4

Special Programs

If participants indicated an interest in the special programs community area they were asked to respond to five additional items. These items were developed to assess an interest in very specialized areas that have additional requirements beyond that of an enlisted Navy rating alone. The five programs were Sea/Air/Land (SEAL), Navy Deep Sea Diver (DIVER), Explosive Ordnance Disposal (EOD), Surface Warfare Combat Crewman (SWCC), and Air Search and Rescue (AIRR). The participants were asked if they were interested in four very specific images per item, and they were asked to respond yes or no. Two hundred and seventeen participants indicated an interest in Navy special programs. Seventy-three percent of these recruits indicated that they were interested in being a Navy SEAL. A relatively equal number of participants, however, also indicated an interest in the other four programs (see Table 3).

Table 3
Participant responses for the Special Program Community area items

Special Programs	Not interested	Interested
Air Search and Rescue (AIRR)		
N	67	150
%	30.9	69.1
Explosive Ordnance Disposal (EOD)		
N	77	140
%	35.5	64.5
Navy Deep Sea Diver (DIVER)		
N	100	117
%	46.1	53.9

Table 3
Participant responses for the Special Program Community area items

Sea/Air/Land (SEAL)		
N	59	158
%	27.2	72.8
Special Warfare Combat Crewman (SWCC)		
N	66	150
%	30.6	69.4

Work-styles and Environments

Participants were asked to indicate their interest in working in four different types of styles and in four types of work environments. Participants were asked to indicate their level of interest in these work dimensions using a continuous 100-point scale, with 0 indicating that the participant was not interested, and 100 indicating very interested. Analysis of work-style preference indicated that participants preferred working with a team (M = 77.49, SD = 25.59) while performing physical work activities (M = 70.24, SD = 28.02). With regard to a work environment, participants preferred working outdoors (M = 79.55, SD = 27.31) with a lower preference for working in an office setting (M = 49.01, SD = 35.38). The average across these eight items (M = 63.11) and the large standard deviations indicate that participants' interest levels vary across and within these work dimensions (see Table 4).

Table 4
Work-Style and Work Environment item descriptive statistics

	M	SD	N	Minimum	Maximum
Indoor	55.17	30.68	287	0	100
Outdoor	79.55	27.31	287	0	100
Office	49.01	35.38	287	0	100
Industrial	44.74	31.23	287	0	100
Mental	62.75	30.45	287	0	100
Physical	70.24	28.02	287	0	100
Work Independently	65.93	29.53	287	0	100
Work with a Team	77.49	25.59	287	0	100

Analyses were performed to investigate if any differences existed in participants' interest in different work styles and in working in different environments when gender and race were used as grouping variables. Statistical differences were found when each of the demographic variables was considered. Mean differences in interest level existed

in five items when race was considered, and three differences were found when gender was considered. It seems that minority races indicated a larger mean interest level for working independently, t (1,246) = 2.65, $p < .05$; indoors, t (1,246) = 2.34, $p < .05$; and in an office environment, t (1,246) = 4.04, $p <$. 05. In comparison, non-minority participants indicated a greater preference for physical work, t (1,246) = -2.11, $p < .05$; in an outdoor environment, t (1,246) = -2.42, $p < .05$. Finally, results for this dimension indicated that female recruits indicated a larger mean interest level for work in an office setting; t (1,273) = 4.23, $p < .05$; whereas males indicated a greater preference for physical work, t (1,273) = -2.70, $p < .05$, in an industrial setting, t (1,273) = -2.34, $p < .05$.

Work Activity Item Analyses

Descriptive Statistical Analyses

Participants were asked to indicate their level of interest regarding 26 work activities. Each work activity was presented in a random order, three times, with different images each time, and again a 100-point response scale was used. An analysis was performed to determine if the order in which the work activity items were presented influenced the level of interest indicated. A general trend was found indicating that the later in the inventory an individual item was presented the lower the interest level indicated. With regards to mean interest levels, the recruits seemed least interested in operating facilities and most interested in operating weapons (M = 34.79, SD = 32.03 and M = 73.94, SD = 31.24, respectively). Descriptive statistics for each of the work activity items are presented in Table 5. The average across these 78 items (M = 48.28) and the large standard deviations (ranging from 29.10 to 35.20) indicate that participants' interest levels vary across and within the work activities.

Again, with these items additional analyses were performed to investigate if any differences existed in participants' interests when gender and race were used as grouping variables. Statistical differences were found when these demographic variables were considered. Mean differences in interest level existed in 8 items when race was considered, and 16 differences were found when gender was considered. Minority participants indicated a larger mean interest level for the following work activities when compared to non-minority participants: analyze data, t (1,246) = 2.21, $p < .05$; analyze documents, t (1,246) = 2.20, $p < .05$; maintain documents, t (1,246) = 3.00, $p < .05$; make documents, t (1,246) = 3.43, $p < .05$; operate facilities, t (1,246) = 3.10, $p < .05$; operate office equipment, t (1,246) = 4.54, $p < .05$; serve customers, t (1,246) = 2.59, $p < .05$; and train people, t (1,246) = 2.86, $p < .05$. Female recruits indicated a greater preference for the following activities: analyze documents, t (1,273) = 3.84, $p < .05$; maintain documents, t (1, 273) = 5.19, $p < .05$; make communications, t (1, 273) = 2.33, $p < .05$; make documents, t (1, 273) = 3.85, $p < .05$; operate facilities, t (1, 273) = 2.85, $p < .05$; operate office equipment, t (1, 273) = 3.37, $p < .05$; and serve customers, t (1, 273) = 4.50, $p < .05$. In comparison, males indicated a larger mean interest level in the following activities: maintain electrical equipment, t (1,273) = -4.33, $p < .05$; maintain electronic equipment, t (1,273) = -4.66, $p < .05$; maintain mechanical equipment, t

(1,273) = -4.43, $p < .05$; maintain weapons, t (1,273) = -7.38, $p < .05$; make mechanical equipment, t (1,273) = -4.01, $p < .05$; operate electrical equipment, t (1,273) = -3.38, $p < .05$; operate electronic equipment, t (1,273) = -3.08, $p < .05$; operate mechanical equipment, t (1,273) = -4.31, $p < .05$; and operate weapons, t (1,273) = -8.37, $p < .05$.

Table 5
Work Activity item descriptive statistics and internal consistency reliability statistics

	α	Item	M	SD
Total	0.9099	--	--	--
		Response 1	48.23	33.95
		Response 2	48.39	33.52
		Response 3	48.23	34.01
Analyze Communications	0.8931	Response 1	44.44	31.15
		Response 2	45.31	30.84
		Response 3	44.36	31.18
Analyze Data	0.8706	Response 1	42.08	32.20
		Response 2	44.19	31.42
		Response 3	42.44	32.07
Analyze Documents	0.8613	Response 1	41.77	31.67
		Response 2	44.29	31.25
		Response 3	41.34	32.32
Direct Aircraft	0.9270	Response 1	54.29	33.89
		Response 2	52.21	34.18
		Response 3	53.61	34.55
Direct Emergency Response	0.8974	Response 1	56.17	32.68
		Response 2	55.93	32.66
		Response 3	57.76	32.84
Maintain Documents	0.9068	Response 1	37.44	31.79
		Response 2	37.61	31.24
		Response 3	37.75	31.57
Maintain Electrical Equipment	0.9357	Response 1	45.41	33.50
		Response 2	45.03	33.38
		Response 3	45.58	33.60
Maintain Electronic Equipment	0.9128	Response 1	47.66	33.56
		Response 2	48.89	33.52
		Response 3	46.29	33.24

Table 5
Work Activity item descriptive statistics and internal consistency reliability statistics

	α	Item	M	SD
Maintain Facilities	0.8719	Response 1	34.45	30.68
		Response 2	34.29	30.06
		Response 3	34.71	30.78
Maintain Mechanical Equipment	0.8687	Response 1	46.36	33.18
		Response 2	47.59	32.60
		Response 3	48.55	34.32
Maintain Security	0.8984	Response 1	61.84	32.21
		Response 2	61.06	33.49
		Response 3	56.91	33.48
Maintain Supplies	0.8842	Response 1	36.78	29.82
		Response 2	35.42	29.10
		Response 3	40.02	30.99
Maintain Weapons	0.9249	Response 1	58.68	34.44
		Response 2	61.05	33.89
		Response 3	61.89	34.69
Make Communications	0.8589	Response 1	45.41	31.65
		Response 2	44.68	29.23
		Response 3	45.70	30.46
Make Documents	0.8814	Response 1	38.03	32.50
		Response 2	38.22	31.58
		Response 3	39.27	31.30
Make Facilities	0.9452	Response 1	44.67	34.34
		Response 2	45.79	34.43
		Response 3	45.19	34.86
Make Mechanical Equipment	0.9194	Response 1	46.17	32.79
		Response 2	44.32	32.19
		Response 3	44.01	33.78
Operate Electrical Equipment	0.8980	Response 1	48.77	32.03
		Response 2	46.10	32.74
		Response 3	48.69	32.65
Operate Electronic Equipment	0.8886	Response 1	52.37	32.45
		Response 2	51.25	33.37
		Response 3	54.12	32.05

Table 5
Work Activity item descriptive statistics and internal consistency reliability statistics

	α	Item	M	SD
Operate Facilities	0.9110	Response 1	35.09	32.34
		Response 2	37.53	32.77
		Response 3	31.73	30.79
Operate Mechanical Equipment	0.8302	Response 1	56.47	32.56
		Response 2	53.24	31.47
		Response 3	52.55	32.58
Operate Office Equipment	0.9342	Response 1	42.76	35.20
		Response 2	42.83	33.65
		Response 3	42.79	33.66
Operate Weapons	0.9185	Response 1	73.59	32.21
		Response 2	73.32	30.84
		Response 3	74.90	30.74
Respond to Emergencies	0.9189	Response 1	63.66	31.90
		Response 2	64.40	31.89
		Response 3	67.05	31.58
Serve Customers	0.9073	Response 1	40.17	34.33
		Response 2	43.51	34.39
		Response 3	37.72	33.38
Train People	0.9053	Response 1	59.54	32.07
		Response 2	60.07	30.96
		Response 3	59.09	32.18

Internal Consistency Reliability Analyses

A reliability analysis was conducted to determine the internal consistency of all work activities. In addition to the aforementioned analysis, the internal consistency for each individual work activity, across the three items was computed (see Table 5). The internal consistency reliability estimate (or alpha) across all the work activities was very good (α = 0.91). The reliability estimates for the individual work activity items were also good, ranging from 0.83 (operate mechanical equipment) to 0.95 (make facilities).

Exploratory Scale Analyses

An exploratory factor analysis of participants' responses was conducted to determine if work activity items could be grouped into interpretable scales. A principal axis factor analysis with varimax rotation accounted for 73 percent of the variance among the work activities, and indicated that a 10-component solution provided the best description of

the data. Each of the 10 factors extracted contained work activities that could easily be construed as the individual scales (see Table 6). For example, all of the work activities describing administrative tasks loaded on the first factor; analyze communications, analyze data, analyze documents, make communications, make documents, maintain documents, and operate office equipment. Finally, the internal consistency of the individual aforementioned scales was investigated. The reliability estimates were very good, ranging from 0.96 for the administrative duties scale to 0.90 for the security duties scale.

Table 6
Factor loadings and reliability estimates of Work Activity item scales

Scale	α	Items	Factor Loading
Administration	0.96	Analyze Communications 1	0.72
		Analyze Communications 2	0.69
		Analyze Communications 3	0.73
		Analyze Data 1	0.73
		Analyze Data 2	0.78
		Analyze Data 3	0.74
		Analyze Documents1	0.76
		Analyze Documents 2	0.74
		Analyze Documents 3	0.72
		Make Communications 1	0.60
		Make Communications 2	0.64
		Make Communications 3	0.59
		Make Documents 1	0.65
		Make Documents 2	0.67
		Make Documents 3	0.66
		Maintain Documents 1	0.67
		Maintain Documents 2	0.71
		Maintain Documents 3	0.70
		Operate Office Equipment 1	0.51
		Operate Office Equipment 2	0.56
		Operate Office Equipment 3	0.53
Support Service	0.94	Maintain Facilities 1	0.59
		Maintain Facilities 2	0.57
		Maintain Facilities 3	0.60
		Maintain Supplies 1	0.67
		Maintain Supplies 2	0.64
		Maintain Supplies 3	0.54
		Operate Facilities 1	0.81
		Operate Facilities 2	0.81
		Operate Facilities 3	0.79

Table 6
Factor loadings and reliability estimates of Work Activity item scales

Support Service		Serve Customers 1	0.79
		Serve Customers 2	0.73
		Serve Customers 3	0.79
Electrical & Electronics	0.96	Maintain Electrical Equipment 1	0.69
		Maintain Electrical Equipment 2	0.70
		Maintain Electrical Equipment 3	0.66
		Maintain Electronic Equipment 1	0.77
		Maintain Electronic Equipment 2	0.75
		Maintain Electronic Equipment 3	0.76
		Operate Electrical Equipment 1	0.70
		Operate Electrical Equipment 2	0.73
		Operate Electrical Equipment 3	0.77
		Operate Electronic Equipment 1	0.73
		Operate Electronic Equipment 2	0.66
		Operate Electronic Equipment 3	0.63
Mechanical	0.94	Make Mechanical Equipment 1	0.73
		Make Mechanical Equipment 2	0.76
		Make Mechanical Equipment 3	0.76
		Maintain Mechanical Equipment 1	0.67
		Maintain Mechanical Equipment 2	0.65
		Maintain Mechanical Equipment 3	0.80
		Operate Mechanical Equipment 1	0.61
		Operate Mechanical Equipment 2	0.42
		Operate Mechanical Equipment 3	0.51
Emergency Response	0.93	Direct Emergency Response 1	0.77
		Direct Emergency Response 2	0.75
		Direct Emergency Response 3	0.73
		Respond to Emergencies 1	0.82
		Respond to Emergencies 2	0.87
		Respond to Emergencies 3	0.78
Ordnance	0.93	Maintain Weapons 1	0.70
		Maintain Weapons 2	0.67
		Maintain Weapons 3	0.72
		Operate Weapons 1	0.71

Table 6
Factor loadings and reliability estimates of Work Activity item scales

Ordnance		Operate Weapons 2	0.78
		Operate Weapons 3	0.75
Direct Aircraft	0.93	Direct Aircraft 1	0.77
		Direct Aircraft 2	0.74
		Direct Aircraft 3	0.79
Construction	0.95	Make Facilities 1	0.73
		Make Facilities 2	0.69
		Make Facilities 3	0.74
Training	0.91	Train People 1	0.78
		Train People 2	0.78
		Train People 3	0.72
Law Enforcement	0.90	Maintain Security 1	0.70
		Maintain Security 2	0.72
		Maintain Security 3	0.79

Usability Feedback

One final objective was the evaluation of the usability of the computer-administered instrument using recruits to determine the programs functionality under certain organizational constraints (e.g., available test time, recruit characteristics). Several questions were analyzed on the feedback sheet designed to gauge individual differences in level of computer proficiency. The majority of participants indicated that they were experienced computer users, spending an average of 18 hours a week before basic training using a computer. In addition to these questions, participants were asked various questions designed to assess the degree to which JOIN was "user friendly." The results of descriptive statistical analyses suggested that JOIN was well liked by the participants (see Table 7). The vast majority (89%) of recruits indicated that JOIN was easy to use. Regarding aesthetic quality, 84 percent of recruits indicated that they found the software to be visually appealing. Participants rated the instructions (88%) and the tutorials (76%) as being either good or very good. Fifty-six percent of the participants indicated JOIN was very good compared to paper-and-pencil questionnaires that they had completed in the past; however, only 16 percent indicated that JOIN was very good at holding their attention (32% indicated it was good). This latter finding was attributed to the fact that participants felt that JOIN was somewhat repetitive, as indicated in open-ended questions contained on the feedback sheet.

Table 7
Feedback item response statistics

	N	*%*	*M*	*SD*
Usability				
Q1. How would you rate JOIN on the following:				
A. Ease of use...	300		4.16	0.71
very bad	2	0.7		
bad	6	2.0		
neither	26	8.7		
good	174	58.0		
very good	92	30.7		
B. Instructions...	300		4.15	0.70
very bad	1	0.3		
bad	5	1.7		
neither	34	11.3		
good	168	56.0		
very good	92	30.7		
C. Tutorials...	296		3.93	0.77
very bad	3	1.0		
bad	6	2.0		
neither	63	21.3		
good	160	54.1		
very good	64	21.6		
D. Visual Appeal...	298		4.28	0.87
very bad	2	0.7		
bad	12	4.0		
neither	33	11.1		
good	103	34.6		
very good	148	49.7		
E. Increasing understanding of Navy jobs...	300		3.65	1.01
very bad	10	3.3		
bad	24	8.0		
neither	93	31.0		
good	108	36.0		
very good	65	21.7		

Table 7
Feedback item response statistics

F. Holding your attention...	299		3.32	1.17
very bad	26	8.7		
bad	45	15.1		
neither	83	27.8		
good	97	32.4		
very good	48	16.1		
Q2. Compare JOIN to paper-and-pencil tests	298		4.40	.82
very bad	4	1.3		
bad	6	2.0		
neither	23	7.7		
good	99	33.2		
very good	166	55.7		
Information Processing				
Q1. How did the pictures relate to the main work activity headings	291		4.27	.59
very bad	0	0.0		
bad	2	0.7		
neither	16	5.5		
good	174	59.8		
very good	99	34.0		
Q2. Your understanding of what each picture represented was	287		4.25	.69
very bad	1	.3		
bad	5	1.7		
neither	19	6.6		
good	157	54.7		
very good	105	36.6		
Q3. How did you make your decision about your level of interest for each job task?	242		2.92	.99
text	17	7.0		
pictures	77	31.8		
both text and pictures	56	23.1		
other	92	38.0		
If you like one picture “very much” ...how would you respond on the scale below?	284		2.81	.52
below	16	5.6		
halfway	21	7.4		
above	247	87.0		

The data from several of the feedback questions were intended to elucidate the degree to which the textual descriptions and pictures contained in JOIN influenced participants' level of interest. The majority of recruits (94%) indicated that main work activity headings (e.g., Analyze Communications – Receive and interpret visual, audio, verbal, and written communication) were related to the pictures (i.e., the pictorial representation of the text). Furthermore, 91 percent of the participants reported that they had a good understanding of what the pictures represented. Thirty-one percent of the participants indicated that they used the pictures to make their decision regarding their level of interest in each work activity, while 23 percent reported that they used both the text and the pictures.

Data from the responses to the open-ended feedback items were also examined. Overall, the participants liked the computer-adapted format and the pictures contained within JOIN. The most often cited dislike stemmed from the perceived redundancy of items. Each work activity was presented three times in order to assess internal consistency. Also, many of the items contained either a similar process (i.e., analyze, maintain, operate, etc.) or a similar content (e.g., mechanical equipment, communications, electrical equipment, etc.). These two points may explain the consistent reporting of the redundancy and repetitiveness of JOIN.

Discussion Groups

A total of 57 recruits participated in 11 discussion groups, 4 of which had all female participants (N = 21). Six groups were conducted on the first day, three on the second, and two on the final day of testing. Fewer discussion groups were conducted on the second and third days of testing, as the duplication of the information generated within group sessions conducted on the first day of testing was readily apparent (e.g., saturation was occurring). Indeed, there was very little variation in the responses from the participants on the first day to the last day. These groups were used as a platform to discuss emerging questions or problems that had been identified on a day-to-day basis during testing. For all intents and purposes, the information obtained from these groups coincided with the feedback data reported earlier.

Discussion

This research project was a necessary first step to the inclusion of an interest inventory in the current Navy classification system. Currently there is not an instrument available that meets the specific requirements of the Navy that would enable the collection of applicant job interests, in a very limited amount of time, and incorporate those responses in a classification decision. The main goal of the proposed research project was to develop an instrument that would assess the specific work interests of a population of applicants that have little prior knowledge of the Navy's world of work. Several hypotheses were tested during the investigation.

The initial results from the usability testing presented in this paper are very promising on several levels. The first aim was accomplished and pictorial items for an interest instrument were developed that represent various Navy work areas, work styles, work environments, and work activities. The second objective was to gather responses from a group of new recruits during basic training to evaluate the psychometric properties of the pictorial items and content of the computer-administered instrument. The initial evaluation regarding the item content of the instrument included descriptive, reliability, and factor analyses. The descriptive statistical analyses of the JOIN items indicated that there is adequate dispersion of individual responses. In other words, the participants were different in their level of interest in various items. Also, the statistical reliability of the work activity items was assessed and the developed items appear to be very consistent in measuring participant interest in the individual enlisted rating job tasks.

The final objective was the evaluation of the usability of the computer-administered instrument with the recruits to determine the program's functionality under certain organizational constraints (e.g., available test time, recruit characteristics). The results from the analysis of feedback items and discussion sessions suggest that incoming recruits possess the level of computer proficiency necessary to complete the inventory. Finally, with the exception of comments related to the repetition of items, recruits were positive in their evaluation of the quality of the computer-adapted inventory. Initial results suggest that, recruits found the JOIN software to be a user-friendly interface.

By design, the future success of JOIN is predicated on its predictive utility. That is, the success of JOIN is contingent upon the degree to which the consideration of interests leads to better recruit-rating (i.e., recruit-job) classification decisions. Future testing will allow for the assessment of the extent to which interests account for unique variance over and above preexisting screening measures (e.g., mental aptitude, medical conditions, etc.). If subsequent testing and analyses suggest that the consideration of interests leads to better recruit-rating (i.e., recruit-job) classification decisions, then we may conclude that the administration of JOIN to new recruits is a worthwhile endeavor.

The JOIN prototype software is in its initial phase of development, and, as such, the functionality of subsequent versions is potentially limitless; JOIN need not be relegated to measuring interests alone. Although there are numerous potential applications for the JOIN software, one prospect is of particular interest. Specifically, in addition to determining what Navy ratings prospective recruits are interested in, JOIN could actually function to "sell" the Navy. Should JOIN function in this capacity in the future, it would necessitate an in-depth examination of the salient choice criteria that underlie decisions with regards to competing organization/job alternatives. Such considerations could be addressed as subsequent versions of JOIN are released.

References

Baker, H.G., & Ellis, R.T. (1989). Computerized vocational guidance systems. In M.F. Wiskoff & G.M. Rampton (Eds.) *Military personnel measurement: Testing, assignment, evaluation* (pp. 75-95). New York: Praeger.

Barak, A. (1981). Vocational Interests: A cognitive view. *Journal of Vocational Behavior, 19*, 1-14.

Barak, A. (2001). A cognitive view of the nature of vocational interests: Implications for career assessment, counseling, and research. In F.T.L. Leong & A. Barak (Eds.) *Contemporary models in vocational psychology: A volume in honor of Samuel H. Osipow* (pp. 97-131). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Bartol, K.M. (1981). Vocational behavior and career development, 1980: A review. *Journal of Vocational Behavior, 19*, 123-162.

Betz, N. (2001). Career self-efficacy. In F.T.L. Leong & A. Barak (Eds.), *Contemporary models in vocational psychology: A volume in honor of Samuel H. Osipow* (pp. 55-77). Mahwah, NJ: Lawrence Erlbaum Associates.

Borman, W.C., Hedge, J.W., Ferstl, K., & Kaufman, J.D. (2002). *A roadmap for the future of Navy selection/classification* (Tech. Rep. No. 413). Tampa, FL: Personnel Decisions Research Institutes, Inc.

Bretz, R.D., & Judge, T.A. (1994). Person-organization fit and the theory of work adjustment: Implications for satisfaction, tenure, and career success. *Journal of Vocational Behavior, 44*, 32-54.

Burisch, M. (1984). Approaches to personality inventory construction. *American Psychologist, 39*, 214-227.

Dawis, R.V. (1991). Vocational interests, values, and preferences. In M.D. Dunnette & L.M. Hough (Eds.), Handbook of Industrial and Organizational Psychology (2nd ed., Vol. 2, pp. 271-326). Palo Alto, CA: Consulting Psychologists Press.

Dawis, R.V., & Lofquist, L.H. (1984). *A psychological theory of work adjustment.* Minneapolis, MN: University of Minnesota Press.

Edwards, J.R. (1991). Person-job fit: A conceptual integration, literature review and methodological critique. I*nternational Review of Industrial/Organizational Psychology* (Vol. 6, pp. 283-357). London: Wiley.

Fitzgerald, L.F., & Rounds, J.B. (1989). Vocational behavior, 1988: A critical analysis. *Journal of Vocational Behavior, 35*, 105-163.

Foley, P., & Rucker, L.S. (1989). An overview of the Armed Services Vocational Aptitude Battery (ASVAB). In R.F. Dillon & J.W. Pellegrino (Eds.) *Testing: Theoretical and applied perspectives* (pp. 16-35). New York: Praeger.

Gatewood, R.D., & Feild, H.S. (1998). *Human resource selection* (4th ed.). Fort Worth, TX: The Dryden Press.

Gati, I. (1998). Using career-related aspects to elicit preferences and characterize occupations for a better person-environment fit. *Journal of Vocational Behavior, 52*, 343-356.

Gati, I., & Asher, I. (2001). The PIC model for career decision making: Prescreening, in-depth exploration, and choice. In F.T.L. Leong & A. Barak (Eds.) *Contemporary models in vocational psychology: A volume in honor of Samuel H. Osipow* (pp.7-54). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Gottfredson, G.D. (2001). Fostering the scientific practice of vocational psychology. *Journal of Vocational Behavior, 59,* 192-202.

Hackman, J.R., & Oldham, G.R. (1976). Motivation through the design of work: Test of a theory. *Organizational Behavior and Human Performance, 16*, 250-279.

Hansen, J.I.C. (1994). The measurement of vocational interests. In M.G. Rumsey & C.B. Walker (Eds.), *Personnel selection and classification* (pp. 293-316). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Hansen, J.I.C., & Campbell, D.P. (1985). *Manual for the SVIB-SCII* (4th ed.). Stanford, CA: Stanford University Press.

Harmon, L.W. (1999). Measuring interests: Approaches and issues. In M.L. Savickas & A.R. Spokane (Eds.), *Vocational interests: Meaning, measurement, and counseling use* (pp. 171-191). Palo Alto, CA: Davies-Black Publishing/Consulting Psychologists Press, Inc.

Harmon, L.W., Hansen, J.C., Borgen, F.H., & Hammer, A.L. (1994). *Strong applications and technical guide.* Palo Alto, CA: Consulting Psychologists Press, Inc.

Hellman, C.M. (1998). Job satisfaction and intent to leave. *Journal of Psychology, 137*(6), 667-689.

Holland, J.L. (1985). *Making vocational choices: A theory of vocational personalities and work environments* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Holland, J.L., Powell, A.B., & Fristsche, B.A. (1994). *The Self-Directed Search professional user's guide*. Odessa, FL: Psychological Assessment Resources.

Hunter, J. E., & Hunter, R.F. (1984). Validity and utility of alternative predictors of job performance. *Psychological Bulletin, 96*, 72-98.

Jackofsky, E.F., & Peters, L.H. (1983). Job turnover versus company turnover: Reassessment of the March and Simon participation hypothesis. *Journal of Applied Psychology, 68*, 490-495.

Jastak, J.F., & Jastak, S.R. (1970). *The wide range interest opinion test*. Wilmington, DE: Guidance Associates of Delaware, Inc.

Jensen, A.R. (1985). Armed Services Vocational Aptitude Battery. *Measurement & Evaluation in Counseling & Development,* 18(1), 32–37.

Karren, R.J., & Graves, L.M. (1994). Assessing person-organization fit in personnel selection: Guidelines for future research. *International Journal of Selection and Assessment, 2*(3), 146-156.

Kristof, A. L. (1996). Person-organization fit: An integrative review of its conceptualizations, measurement, and implications. *Personnel Psychology, 49,* 1-49.

Kroeker, L.P. (1989). Personnel classification/assignment models. In M.F. Wiskoff & G.M. Rampton (Eds.), *Military personnel ,measurement: Testing, assignment, evaluation* (pp. 41-73). New York: Praeger.

Kuder, F. (1964). *Manual: KuderGneral Interest Survey*. Chicago: Science Research Associates.

Kuder, F., & Zytowski, D.G. (1991). *Kuder Occupational Interest Survey Form DD: General manual* (3rd ed.). Monterey, CA: CTB/McGraw-Hill.

Kulik, C.T., Oldham, G.R., & Hackman, J.R. (1987). Work design as an approach to person-environment fit. *Journal of Vocational Behavior, 31,* 278-296.

Lent, R.W. (2001). Vocational psychology and career counseling: Inventing the future. *Journal of Vocational Behavior, 59,* 213-225.

Lightfoot, M.A., Alley, W.E., Schultz, S.R., & Watson, S.E. (2000). *The development of a Navy-job specific vocational interest model* (Tech. Rep. No. FR-00-18). Alexandria, VA: Human Resources Research Organization.

Lightfoot, M.A., McBride, J.R., Heggestad, E.D., Alley, W.E., Harmon, L.W., & Rounds, J. (1999). *Navy interest inventory: Approach development* (Tech. Rep. No. FR-WATSD-99-13). San Diego, CA: Space and Naval Warfare Systems Center.

Lofquist, L.H., & Dawis, R.V. (1984). Research on work adjustment and satisfaction: Implications for career counseling. In S.D. Brown & R.W. Lent (Eds.), *Handbook of counseling psychology* (pp. 216-237). New York: Wiley.

Lofquist, L.H., & Dawis, R.V. (1991). *Essentials of person-environment correspondence counseling*. Minneapolis, MN: University of Minnesota Press.

Mumford, M.D., Peterson, N.G., & Childs, R.A. (1999). Basic and cross-functional skills. In N.G. Peterson, M.D. Mumford, W.C. Borman, P.R. Jeanneret, & E.A. Fleishman (Eds.), *An occupational information system for the 21st century: The development of O*NET* (pp. 49-69). Washington, DC: American Psychological Association.

Murphy, G.T. (1984). Validation of a cognitive taxonomy-hierarchy describing behavioral outcomes of instruction: The domain of cognition. *Dissertation Abstracts International,* 45(4-A), 1027).

Murphy, K.R. (1993). Integrating research on work adjustment with research on job performance and behavior in organizations: Perspectives from industrial/organizational psychology. *Journal of Vocational Behavior, 43,* 98-104.

Navy Personnel Research, Studies, and Technology Department. (1998). *Sailor 21: A research vision to attract, retain, and utilize the 21st century sailor* (NPRST-AP-99-1). Millington, TN.

Roe, A., & Seligman, M. (1964). *The origin of interests*. Washington, DC: American Personnel and Guidance Association.

Russell, J.E. (2001). Vocational Psychology: An analysis and directions for the future. *Journal of Vocational Behavior, 59*, 226-234.

Russell, T.L., Knapp, D.J., & Campbell, J.P. (1992). Recommended reading for selection and classification roundtable. (Tech. Rep. No. IR-PRD-92-10). Alexandria, VA: Human Resources Research Organization.

Rynes, S.L. (1991). Recruitment, job choice and post-hire consequences: A call for new research directions. In M.D. Dunnette & L.M. Hough (Eds.), *Handbook of industrial and organizational psychology* (2nd ed., pp. 399-444). Palo Alto, CA: Consulting Psychologists Press.

Savickas, M.L. (1999). The psychology of interests. In M.L. Savickas & A.R. Spokane (Eds.), *Vocational interests: Meaning, measurement, and counseling use* (pp. 19-56). Palo Alto, CA: Davies-Black Publishing/Consulting Psychologists Press, Inc.

Savickas, M.L. (2001). Envisioning the future of vocational psychology. *Journal of Vocational Behavior, 59*, 167-170.

Savickas, M.L., & Spokane, A.R. (Eds). (1999). *Vocational interests: Meaning, measurement, and counseling use*. Palo Alto, CA: Davies-Black Publishing/Consulting Psychologists Press, Inc.

Schippmann, J.S. (1999). *Strategic job modeling: Working at the core of integrated human resources*. Mahwah, NJ: Lawrence Erlbaum Associates.

Schneider, B. (1987). The people make the place. *Personnel Psychology, 40*, 437-453.

Schratz, M.K., & Ree, M.J. (1989). Enlisted selection and classification: Advances in testing. In M.F. Wiskoff & G.M. Rampton (Eds.) *Military personnel measurement: Testing, assignment, evaluation* (pp. 1-40). New York: Praeger.

Spencer, D.G., & Steers, R.M. (1981). Performance as a moderator of the job-satisfaction-turnover relationship. *Journal of Applied Psychology, 66*, 511-514.

Spokane, A. R. (1985). A review of the research of person-environment congruence in Holland's theory of careers [Monograph]. *Journal of Vocational Behavior, 26*, 306-343.

Strong, E.K., Jr. (1955). *Vocational interests 18 years after college.* Minneapolis: University of Minnesota Press.

Super, D.E. (1949). *Appraising vocational fitness by means of psychological tests*. New York: Harper & Row.

Tranberg, M., Slane, S., & Ekeberg, S.E. (1993). The relation between interest congruence and satisfaction: A metaanalysis. *Journal of Vocational Behavior, 42*, 253-264.

Tziner, A., Meir, E.I., & Segal, H. (2002). Occupational congruence and personal task-related attributes: How do they relate to work performance? *Journal of Career Assessment, 10*, 401-412.

U.S. Navy. (2001). *Military equal opportunity assessment: Fiscal year 2001.* Washington, DC: Author.

Vroom, V. (1964). *Work and motivation*. New York: Wiley.

Watson, S.E. (2002). *The rating identification engine (RIDE)*. Manuscript in preparation.

Watson, S.E., Hindelang, R.L., & Michael, P.G. (2002). *Applying job analysis to the development of a Navy-specific vocational interest model*. Manuscript in preparation.

Werbel, J., & Gilliland, S.W. (1999). Person-environment fit in the selection process. In G.R. Ferris (Ed.) *Research in personnel and human resources management, 17*, 209-243.

Wilbourn, J.M., & Alley, W.E. (1978). *Pictorial interest inventory development*. (AFHRL/TR 78-36). Brooks Air force Base, TX: Air Force Human Resources Laboratory, Air force Systems Command.

Wiskoff, M.F., & Rampton, G.M. (Eds.). (1989). *Military personnel measurement: Testing, assignment, evaluation*. New York: Praeger.

Appendix A:
Jobs and Occupational Interest in the Navy (JOIN)
Textual Items

Table A-1
Job Opportunities in the Navy (JOIN) Textual Items

Navy Community Areas	
Aviation	Submarine
Construction	Surface
Health Care	Special Programs
Intelligence	Support
Work Styles	
Mental	Work independently
Physical	Work with a team
Work Environments	
Indoor	Industrial
Outdoor	Office

Work Activity Items

Analyze Communications—Receive and interpret visual, audio, verbal, and written communication
Analyze Data—Compile and interpret visual, audio, verbal, and written information
Analyze Documents—Interpret written, photographed, and illustrated material
Direct Aircraft—Organize, dispatch, and guide airplanes and helicopters
Direct Emergency Response—Organize, dispatch, and guide personnel to react to critical and urgent situations
Maintain Documents—Organize, review, and update written, photographed, and illustrated material
Maintain Electrical Equipment—Service and repair motors, generators, and switchboards
Maintain Electronic Equipment—Service and repair sonar, radar, communication, and system monitoring equipment
Maintain Facilities—Sustain an area of operation
Maintain Mechanical Equipment—Monitor, service, and repair machinery and simple mechanical equipment
Maintain Security—Monitor, guard and police Navy ships, aircraft, and shore installations
Maintain Supplies—Monitor and sustain inventory
Maintain Weapons—Service and repair small arms, missile systems, and other munitions
Make Communications—Create and communicate visual, audio, verbal, and written information
Make Documents—Produce written, photographed, and illustrated material
Make Facilities—Construct buildings, bridges, and walls
Make Mechanical Equipment—Manufacture and fabricate machinery and simple mechanical equipment
Operate Electrical Equipment—Activate, drive, and control motors, generators, and switchboards

Table A-1
Job Opportunities in the Navy (JOIN) Textual Items

Operate Electronic Equipment—Operate sonar, radar, communication, and system monitoring equipment
Operate Facilities—Manage, regulate, and coordinate an area of operation (e.g., barber shops, laundry, ship store, vending, retail)
Operate Mechanical Equipment—Activate, drive, and control machinery and simple mechanical equipment
Operate Office Equipment—Use standard office related equipment such as typewriters, adding machines, cameras, presses, file cabinets, etc.
Operate Weapons—Shoot, fire, and control small arms, missile systems, and other munitions
Respond to Emergencies—React to and take appropriate measures in critical and urgent situations
Serve Customers—Provide goods and services to patrons and consumers
Train People—Instruct and develop personnel in professions, skills, or occupations

Appendix B:
JOIN Model

Navy Rating by Item Matrix

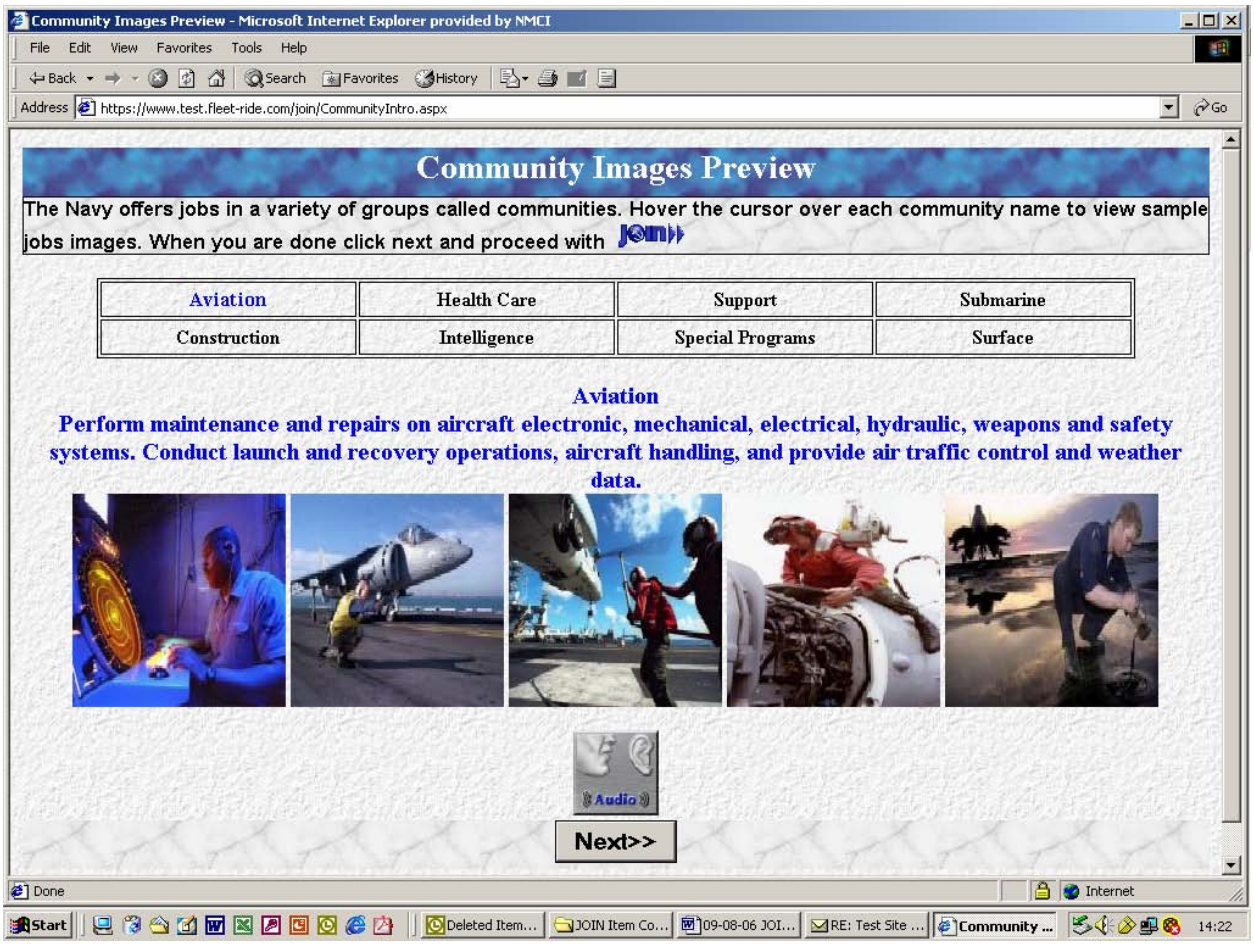
	Community Areas...			
Job	**Aviation**	**Construction**	**Healthcare**	**Surface**
Yeoman, YN	1	1	0	1
Hospital Corpsman, HM	0	0	1	0
Builder, BU	0	1	0	0
Air Traffic Controller, AC	1	0	0	1

	Work Styles...		Work Environments...	
Job	**Physical**	**Work Independently**	**Office**	**Outdoor**
YN	0	1	1	0
HM	0	0	1	0
BU	1	0	0	1
AC	0	1	1	0

	Work Activities...						
Job	**Analyze Data**	**Direct Aircraft**	**Maintain Documents**	**Make Facilities**	**Operate Weapons**	**Serve Customers**	**Train People**
YN	0	0	1	0	0	1	0
HM	0	0	1	0	0	1	0
BU	0	0	0	1	1	0	0
AC	1	1	1	0	0	0	0

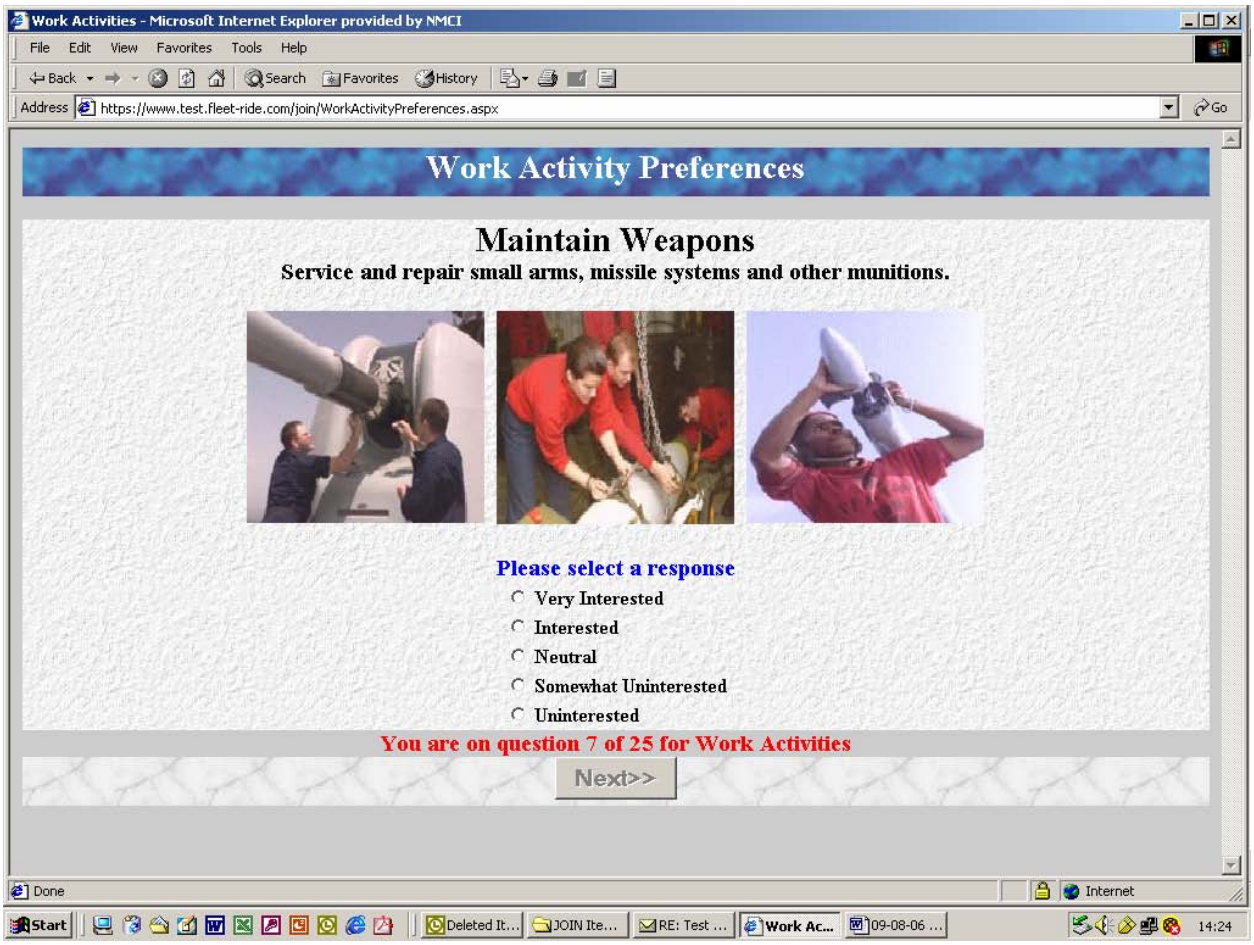
*Note: A 79 x 41matrix was established with the Navy jobs listed in each row and the dimensions of work were in each column. A “1” in the cell indicates the item is relevant to that job, and a “0” indicates the item is absent from that particular job.

Appendix C:
JOIN Community Areas Sample Screen



Jobs Opportunities in the Navy (JOIN)

Appendix D:
JOIN Work Activity Sample Screen



Jobs Opportunities in the Navy (JOIN)

Appendix E:
JOIN Feedback Data Sheet

JOIN Feedback

The purpose of this questionnaire is to evaluate JOIN. Your responses will be analyzed and maintained by NPRST (PERS-13). All responses will be held in confidence. Information provided will be summarized and will not be attributable to individuals. Your participation is completely voluntary. Failure to respond will NOT result in any penalties with the exception of lack of representation of your views in final results and outcomes.

Instructions: Please take a moment to reflect back on JOIN and answer the following questions.

Usability

1. How would you rate JOIN on the following:

   a. Ease of use...

   Explain

   b. Instructions...

   Explain

   c. Tutorials...

   Explain

   d. Visual appeal...

   Explain

   e. Increasing your understanding of Navy jobs...

   Explain

   f. Holding your attention...

   Explain

2. Compared to paper and pencil questionnaires I have taken, the computerized version of JOIN was...

   Explain

<u>Instructions:</u> Please take a moment to reflect back on the pictures used in JOIN and answer the following questions.

Information Processing

3. How did the pictures relate to the main work activity headings (e.g., Analyze data)?
4. Your understanding of what each picture represented was...
5. How did you make your decision about your level of interest for each job task?
6. If you liked one picture "very much" out of the three presented, how would you respond on the scale below? Mark an "X" on the scale to indicate your response.

   *Note: A 5-point response scale, ranging from very bad to very good and including neither, was used for question 1a-1f, 2, 3, and 4.

<u>Instructions:</u> Please answer the following questions completely.

Feedback

1. What did you like about JOIN?
2. What did you dislike about JOIN?
3. Suggestions/ Recommendations?

Background Information

1. With regard to your computer skills, would you say that you are... (5-point scale, not experienced to very experienced)
2. How many hours per week do you spend using a computer?
3. What is your rating, or what training program are you currently in? or mark if undesignated
4. Age
5. Gender
6. Ethnicity

Distribution

AIR UNIVERSITY LIBRARY
ARMY MANAGEMENT STAFF COLLEGE LIBRARY
ARMY RESEARCH INSTITUTE LIBRARY
ARMY WAR COLLEGE LIBRARY
CENTER FOR NAVAL ANALYSES LIBRARY
DEFENSE TECHNICAL INFORMATION CENTER
HUMAN RESOURCES DIRECTORATE TECHNICAL LIBRARY
JOINT FORCES STAFF COLLEGE LIBRARY
MARINE CORPS UNIVERSITY LIBRARIES
NATIONAL DEFENSE UNIVERSITY LIBRARY
NAVAL HEALTH RESEARCH CENTER WILKINS BIOMEDICAL LIBRARY
NAVAL POSTGRADUATE SCHOOL DUDLEY KNOX LIBRARY
NAVAL RESEARCH LABORATORY RUTH HOOKER RESEARCH LIBRARY
NAVAL WAR COLLEGE LIBRARY
NAVY PERSONNEL RESEARCH, STUDIES, AND TECHNOLOGY SPISHOCK LIBRARY (3)
PENTAGON LIBRARY
USAF ACADEMY LIBRARY
US COAST GUARD ACADEMY LIBRARY
US MERCHANT MARINE ACADEMY BLAND LIBRARY
US MILITARY ACADEMY AT WEST POINT LIBRARY
US NAVAL ACADEMY NIMITZ LIBRARY