# Development of the O*NET™ Computerized Work Importance Profiler

**Rod McCloy, Gordon Waugh, and Gina Medsker**
**Human Resources Research Organization**

**Janet Wall**
**ACT**

**David Rivkin and Phil Lewis**
**National Center for O*NET Development**


**National Center for O*NET Development**
**Employment Security Commission**
**Post Office Box 27625**
**Raleigh, North Carolina 27611**
**e-mail: onet@ncmail.net**

**1999**

# Acknowledgments

The O*NET™ Work Importance Profiler was produced and funded by the O*NET project of the U.S. Department of Labor, Employment and Training Administration, Office of Policy and Research (OPR) under the direction of Gerard F. Fiala, Administrator. The O*NET project is directed by Jim Woods, Office of Policy and Research, and Donna Dye, Office of Workforce Security.

The instrument was created through Department of Labor grants with the National O*NET Consortium, National Center for O*NET Development; the North Carolina Employment Security Commission, Southern Assessment Research and Development Center; the Utah Department of Employment Security, Western Assessment Research and Development Center; the New York Department of Labor, Eastern Assessment Research and Development Center, and the Michigan Employment Security Commission, Northern Assessment Research and Development Center.

The project was completed under the direction of David Rivkin and Phil Lewis. The Human Resources Research Organization (HumRRO) was the primary contractor in developing the instrument. Their team was led by Dr. Rodney McCloy. Trefoil Corporation and eGuidance Solutions developed the software for the instrument. Dr. Gary Carter, John Boyle, and Dan Connell initiated and participated in much of the research effort associated with developing the instrument.

Numerous research phases were conducted in developing the O*NET Work Importance Profiler. Each phase required multiple steps and the participation of a wide variety of staff, contractors, and pilot sites. Grateful acknowledgment for their prominent roles in this process is made to Jeannie Stroupe, Dr. Stephen Atkins, Helen Tannenbaum, Ray Dobrin, Enid Israelson, Ann Kump, Diana Williams, Dell Alston, Ronald Boese, Brenda Dunn and Jerry Pickett.

A special thanks is given to Dr. René V. Dawis who served as the overall technical advisor for the project and whose previous research inspired the work. Thanks is also given to Drs. Janet Wall and Jeffrey Worst for their assistance in developing the instrument and associated materials.

# Development of the O*NET Computerized Work Importance Profiler

## Table of Contents

## Appendices



## List of Tables

## List of Figures

# Executive Summary

The U.S. Department of Labor's (USDOL's) Office of Policy and Research has developed the Occupational Information Network (O*NET™), a comprehensive system for collecting, organizing, describing, and disseminating data on occupational characteristics and worker attributes (see *O*NET Final Technical Report*, 1998). O*NET is the replacement for the *Dictionary of Occupational Titles (DOT*; U.S. Department of Labor, 1991). O*NET includes the Content Model, a skills-based structure that serves as the framework for organizing the information describing the world of work presented within O*NET (see *Development of Prototype Occupational Information Network (O*NET) Content Model*, 1995). The Office of Policy and Research initiated several projects aimed at producing valid and reliable data covering a majority of the variables described in the O*NET Content Model. This report focuses on the effort to generate work-related values information included in the Worker Characteristics domain of the model (i.e., identifying features of employment which O*NET users may value or view as personally important). Inclusion of such work importance (i.e., work values) information within O*NET provides an important data set for career guidance and research. In December 1998, O*NET 98 was released, the first presentation of the O*NET data to the public. For more information, see the *O*NET 98 Viewer User's Guide* (USDOL, 1998).

It is important to note that USDOL's Office of Policy and Research has developed career exploration and development tools in an effort to create more complete, flexible services. The career exploration tools link directly to O*NET. For example, the work importance instruments USDOL has developed will enable users to link their results directly to the work values information provided in O*NET. These materials will allow individuals to use a variety of assessment information about themselves (e.g., vocational interests, skills and abilities, education, experience, as well as work values) to explore careers either individually, with a career counselor, or in a group.

The U.S. Department of Labor's (USDOL's) National O*NET Consortium contracted with the Human Resources Research Organization (HumRRO) to complete a project aimed at developing two measures of work values. The work values measures would be a part of a set of measures to complement the USDOL's Occupational Information Network (O*NET), a new computerized database of occupational information that eventually will replace the *Dictionary of Occupational Titles* (*DOT*; U.S. Department of Labor, 1965, 1977, 1991). The work values project had three parts: a) the design and evaluation of a computerized measure of work values; b) the design and evaluation of a paper-and-pencil measure of work values; and c) the determination of the work values score profiles (i.e., occupational reinforcer patterns) of the 1,122 Occupational Units (OUs) of the O*NET. The purpose of this report is to describe and document the development and evaluation of the computerized work values measure, O*NET Work Importance Profiler (WIP-C). Two separate reports describe the development of the paper-and-pencil work values measure, O*NET Work Importance Locator (WIL-P&P; McCloy, Waugh, Medsker, Wall, Lewis and Rivkin;1999C), and the associated occupational reinforcer patterns (ORP; McCloy, Waugh, Medsker, Wall, Lewis and Rivkin, 1999B).

The WIL-P&P and WIP-C were modeled on the Minnesota Importance Questionnaire (MIQ; Rounds, Henly, Dawis, Lofquist, & Weiss, 1981). The measures were designed for self-

assessment, thus affording individual job seekers the chance to receive immediate feedback about the characteristics of occupations they find most important (i.e., the needs that the client wishes the occupation to reinforce -- presumably enhancing job satisfaction).

WIP-C development involved three studies. During the Pre-Pilot Study, 10 employees selected from HumRRO and from the National Center for O*NET Development completed the draft version of the WIP-C. During the Pilot Study, 43 employment center participants took the improved WIP-C. Administrators observed these participants, and participants completed reaction forms. Results from the first two studies were used to improve the WIP-C. Finally, during the Main Study, the WIL-P&P, WIP-C, and MIQ were administered to employment center clients and junior college students at 23 sites. Respondents took two of the three instruments, so that information on the same respondents taking different measures would be available. Some respondents also took the same instruments at two points in time, so that test-retest reliabilities could be computed. Respondents providing useable data totaled 1,199 for the WIL-P&P, 941 for the WIP-C, and 550 for the MIQ. Adequate numbers of male, female, White, Hispanic, and African American respondents provided useable data to allow separate statistical analyses for these subgroups.

Analyses from these studies provide substantial support for the following findings and conclusions:

- The WIP-C required more time to complete than did the WIL-P&P or MIQ.
- Respondents with two or four years of college tended to score higher on Achievement (Value 1) than those with a high school diploma or less than a high school diploma.
- Those with two or four years of college tended to score lower on Comfort (Value 2) than those with a high school diploma.
- Those with two or four years of college tended to score lower on Safety (Value 5) than those with a high school diploma.
- Scores on Autonomy (Value 6) tended to be greater for those with a two or four year college degree than for those with a high school diploma or less.
- Test-retest results for the WIP-C provided moderate to high support for its use.
- Correlations for each *need* for the two administrations of the measure had a median of .63.
- Correlations for the *values* had a median of .62.
- 62 percent of respondents ranked the same value highest on both administrations, and 52 percent ranked the same two values as the top (i.e., highest ranked) two on

both administrations, indicating that the top values can be used with confidence in career exploration.

- The top value on the first administration was ranked first or second on the second administration for 88 percent of respondents, indicating that the top value has very reasonable stability for identifying values for careers.

- The top two needs on the first administration were in the top five needs on the second administration for 80 percent of the respondents, providing support for the use of needs in identifying the specific job needs of individuals.

- Correlations of need profiles and work value profiles between the first and second administration were moderately high ($r$ = .77 for needs and $r$ = .72 for values). Results provide support for the use of the WIP-C and, in particular, for the use of the top few needs or top one or two work values.

- Correlations between the WIP-C and the WIL-P&P and MIQ were calculated and used to examine whether these three measures represented alternate forms of the work values measure, as intended. The correlations for needs between the WIP-C and the WIL-P&P (with adjustment for ipsatization) ranged from .61 to .73, and the correlations for values between these two measures ranged from .73 to .85.

- The correlations for needs between the WIP-C and MIQ ranged from .55 to .84, and the correlations for values between these two measures ranged from .67 to .84. Although some correlations for individual needs were lower than desirable, the correlations showed similar patterns, despite differences in items wording.

- Coefficient alpha internal consistency reliability figures for the WIP-C were in the .70s and .80s for five of the six value scales; the reliability was lower for the Altruism scale.

- Both exploratory and confirmatory analyses for the two measures supported a seven-factor structure over the theoretical six-factor structure.

- The MIQ and WIP-C had very similar factor structures, supporting the idea that the two instruments are measuring similar constructs. This suggests that the WIP-C can be substituted for the MIQ.

The technical qualities of the WIP-C appear to support the use of both the values and, to a greater extent, needs that are identified from the instrument as important to individuals. The results of the instrument are sufficiently credible for use within a career exploration process.

# Chapter 1. Introduction

## Overview and Purposes of Project

The U.S. Department of Labor's (USDOL's) Office of Policy and Research has developed the Occupational Information Network (O*NET™), a comprehensive system for collecting, organizing, describing, and disseminating data on occupational characteristics and worker attributes (see *O*NET Final Technical Report*, 1998). O*NET is the replacement for the *Dictionary of Occupational Titles* (*DOT*; U.S. Department of Labor, 1991). O*NET includes the Content Model, a skills-based structure that serves as the framework for organizing the information describing the world of work presented within O*NET (see *Development of Prototype Occupational Information Network (O*NET) Content Model*, 1995). The Office of Policy and Research initiated several projects aimed at producing valid and reliable data covering a majority of the variables described in the O*NET Content Model. This report focuses on the effort to generate work-related values information included in the Worker Characteristics domain of the model (i.e., identifying features of employment which O*NET users may value or view as personally important). Inclusion of such work importance (i.e., work values) information within O*NET provides an important data set for career guidance and research. In December, 1998, O*NET 98 was released, the first presentation of the O*NET data to the public. For more information, see the *O*NET 98 Viewer User's Guide* (USDOL, 1998).

It is important to note that USDOL's Office of Policy and Research has developed career exploration and development tools in an effort to create more complete, flexible services. The career exploration tools link directly to O*NET. For example, the work importance instruments USDOL has developed will enable users to link their results directly to the work values information provided in O*NET. These materials will allow individuals to use a variety of assessment information about themselves (e.g., vocational interests, skills and abilities, education, experience, as well as work values) to explore careers either individually, with a career counselor, or in a group. Examples of career exploration materials USDOL has developed include:

1. The **O*NET Interest Profiler**, which measures six broad vocational interest areas that coincide with the RIASEC model (Holland, 1997).

2. The **O*NET Ability Profiler**, which measures nine different abilities directly linked to job performance.

3. The **O*NET Work Importance Profiler**, which allows individuals to identify values that are important to them (e.g., features of employment they personally value or find to be important).

Most of these tools will be available in both automated and paper formats to meet the needs of a variety of users.

The U.S. Department of Labor's (USDOL's) National O*NET Consortium contracted with the Human Resources Research Organization (HumRRO) to complete a project aimed at developing two measures of work values. The work values measures would be part of a set of measures to

complement USDOL's Occupational Information Network (O*NET), a new computerized database of occupational information that eventually will replace the *Dictionary of Occupational Titles* (*DOT*; U.S. Department of Labor, 1965, 1977, 1991).

The Work Values project had three distinct parts. The purpose of Part I was to design and evaluate a new computerized measure of work values. The purpose of Part II was to design and evaluate a similar paper-and-pencil measure of work values. The purpose of Part III was to determine the work values score profiles, or occupational reinforcer patterns (ORPs), of the 1,122 Occupational Units (OUs—groups of occupations from the *DOT*) contained in O*NET. This report describes the development and evaluation process of the computerized measure of work values, O*NET Work Importance Profiler (WIP-C). Two separate reports describe the development of the paper-and-pencil work values measure, the O*NET Work Importance Locator (WIL-P&P; McCloy, Waugh, Medsker, Wall, Lewis and Rivkin, 1999C), and the associated occupational reinforcer patterns (ORP; McCloy, Waugh, Medsker, Wall, Lewis and Rivkin, 1999B).

Both the computerized and paper-and-pencil work values instruments will be available as stand-alone measures of work values related to O*NET. The information and services sponsored by the USDOL include: a) a set of career exploration tools, b) occupational classification structures that are accessed via assessment data, and c) occupational information from O*NET. Assessment tools to be included are the work values instruments (just described), an ability profiler, and an interest profiler. Individuals requesting career guidance or wishing to engage in career exploration will be guided toward occupational groupings based on their scores on the various assessment tools. From there, more informed decisions can be made about occupations.

The work values instruments developed in this project measure individuals' work needs and values and are based on a previously developed measure of work values, the Minnesota Importance Questionnaire (MIQ; Rounds, Henly, Dawis, Lofquist & Weiss, 1981). All items on the WIP-C and WIL-P&P were based on items from the MIQ (with some changes in wording to be consistent with the wording developed for O*NET). The MIQ requires that answer sheets be sent to the publisher to be scored. The first purpose of the work values project was to develop new work values measures that could be scored immediately. The work values instruments were specifically designed to make scores immediately available to the respondent. In the WIP-C, the computer calculates the scores and displays them on the screen; in the WIL-P&P, the respondent calculates the scores by hand after completing the instrument.

This report focuses on the development of the WIP-C, which involved three studies: a Pre-Pilot Study, Pilot Study, and Main Study. Data for these studies were collected at four points in time (referred to as Time 1, Time 2, Time 3, and Time 4). At Time 1, the Pre-Pilot Study was conducted to examine the initial development of the WIP-C based on the MIQ. At Time 2, the Pilot Study was conducted to further refine the new measure to prepare it for use in the Main Study. Data for the Main Study were collected at Times 3 and 4. In the Main Study, data from Times 3 and 4 were used to examine the test-retest reliability of the new measure. Data from Time 3 were also used to evaluate other psychometric characteristics of the measure, including: a) descriptive statistics on respondents, items, and value scales; b) comparative statistics for the three work values measures (WIP-C, WIL-P&P, and MIQ); c) response consistencies and errors; d) completion times; e)

relationships of values to educational level, racial/ethnic group, and gender; f) consistency of needs and values expressed on the three need/value measures; g) internal consistency within measures; and h) factor analyses of how need items group together into values. The Pre-Pilot, Pilot, and Main Study are discussed in the several chapters of this report that immediately follow this first chapter.

The purpose of Part III of this project was to determine the occupational reinforcer patterns (ORPs) of the 1,122 OUs. These ORPs are to be used in conjunction with the work values instruments. ORPs are occupation-specific profiles of scores on the 21 needs. They describe: a) reinforcing characteristics of work content (e.g., authority, creativity); and b) reinforcing conditions of the work environment (e.g., compensation, advancement potential). ORPs are based on expert ratings of the presence or absence of the reinforcers in specific occupations.

The items of the work values instruments are virtually identical to the items used to assess the ORPs. The primary difference between the WIL-P&P and WIP-C items and ORP items is the referent—the individual respondent for the work values instruments items and the job for the ORP items. The use of virtually identical items simplifies the linking of individual assessment results with occupational information. Through comparison of their score profiles with the ORPs, users can explore the correspondence between the reinforcing qualities of different occupations and their work values, as derived from the score reports from the WIP-C. WIP-C respondents can compare their individual work value profiles with the reinforcer profiles of a variety of occupations. Respondents will be able to view information about themselves in relation to parallel information about jobs.

The following sections describe some historical and theoretical background on the measurement of work needs and values and ORPs. This background briefly discusses the development of the measures that are precursors to the measures developed and used in this project. This information should help explain the foundation on which the newly developed measures are based.

## Historical Background on Work Values: The Theory of Work Adjustment

The studies on work adjustment began in 1957 by the Work Adjustment Project at the University of Minnesota under the direction of René Dawis and Lloyd Lofquist. The impetus of their research was to explore aspects of an individual's work adjustment and develop assessment tools to measure and predict an individual's adjustment to work. The *Theory of Work Adjustment* (TWA) was first conceptualized in 1964 (Dawis, Lofquist, & Weiss, 1968; Weiss, Dawis, England, & Lofquist, 1964) and was given more comprehensive treatment in the book *Adjustment to Work* (Lofquist & Dawis, 1969). Early work on the theory was supported by the Rehabilitation Services Administration, Social and Rehabilitation Service, U.S. Department of Health, Education, and Welfare (Dawis & Lofquist, 1984).

The Theory of Work Adjustment is a comprehensive model of vocational adjustment based on the concept of correspondence between individual and environment (Dawis & Lofquist, 1984). The TWA postulates that vocational needs and abilities are instrumental elements of the individual's work personality, while ability requirements and reinforcer systems are significant aspects of the work environment. The degree of correspondence between an individual's skills

and abilities with the ability requirements of the work environment will predict *satisfactoriness*. In addition, the degree of correspondence between an individual's needs and values and the reinforcers available in the work environment will predict satisfaction with work. Dawis and Lofquist summarized the TWA as follows:

- Work is conceptualized as an interaction between an individual and a work environment.
- The work environment requires that certain tasks be performed, and the individual brings skills to perform the tasks.
- In exchange, the individual requires compensation for work performance and certain preferred conditions, such as a safe and comfortable place to work.
- The environment and the individual must continue to meet each other's requirements for the interaction to be maintained. The degree to which the requirements of both are met may be called *correspondence*.
- Work adjustment is the process of achieving and maintaining correspondence. Work adjustment is indicated by the satisfaction of the individual with the work environment and by the satisfaction of the work environment with the individual (the individual's satisfactoriness).
- Satisfaction and satisfactoriness result in tenure, the principal indicator of work adjustment. Tenure can be predicted from the correspondence of an individual's work personality with the work environment.
- Work personalities and work environments can be described in terms of structure and style variables that are measured on the same dimensions (Dawis & Lofquist, 1984, pp. 9-10).

To completely operationalize the TWA, one must measure characteristics of both the individual and the work environment to determine the amount of correspondence between the two. The TWA considers both abilities and vocational needs to be instrumental characteristics of individuals that are relevant to determine the correspondence between the individual and work environment. Instruments such as the General Aptitude Test Battery (GATB; U.S. Department of Labor, 1970), which measures workers' work-related abilities, and the MIQ (Rounds et al., 1981), which measures workers' needs and values, are both tools that have been designed specifically to allow assessments of individual-work environment relationships. Complementary to the ability and need characteristics of individuals are the ability requirements and reinforcer systems of work environments. To assess the degree of correspondence between the needs of an individual and the reinforcer systems of occupational environments, a third measurement tool, such as the Minnesota Job Description Questionnaire (MJDQ; Borgen, Weiss, Tinsley, Dawis, & Lofquist, 1968), is necessary for measuring occupational reinforcer systems or patterns. The MJDQ provides a description of the work environment in need/value terms. The need-reinforcer statements included in the MJDQ are very similar to the statements included in the MIQ (Dawis & Lofquist, 1984) to enable the individual's needs/values to be matched to what the work environments provide in terms of need and value satisfaction or fulfillment. To assess the ability requirements of jobs, a fourth tool, job analysis, is used (specifically, job analysis tools yielding job profiles compatible with worker ability instruments like the GATB).

## The Minnesota Importance Questionnaire (MIQ)

The MIQ was based on the N-Factors Questionnaire, which in turn was based on a questionnaire by Schaffer (1953). The MIQ has been through three revisions since its creation in 1964. It is designed to provide information about an individual's needs and values. Persons completing the MIQ are asked to indicate the relative importance, to them, of 21 vocationally relevant need reinforcers (e.g., receiving recognition, having steady employment). The need-reinforcer dimensions measured by the MIQ have been found to be important to job satisfaction (Gay, Weiss, Hendel, Dawis, & Lofquist, 1971). The 21 needs can be grouped into 6 value dimensions (derived through factor analysis) named Achievement, Comfort, Status, Altruism, Safety, and Autonomy (though these names were later changed – see Chapter 8 and Table 23).

The original form of the MIQ consisted of 20 scales (values) of 5 items each. Respondents were asked to rate the importance of specific aspects of work on a 5-point Likert scale. This form produced negatively skewed distributions of scale scores and yielded high intercorrelations among scale scores (Gay et al., 1971). Ipsative forms of the MIQ, including a paired-comparison form and a multiple ranking form, were developed to overcome these deficiencies.

The Multiple Rank Order 5 (MRO5) version of the MIQ was the basis for the WIP-C. The MRO5 produces scores for 21 needs. Related needs are combined into six work values scales. According to the TWA, needs and values with high scores are important to a person's satisfaction; needs and values with low scores have little or no effect upon a person's satisfaction. For example, the level of Independence inherent in a specific job will greatly affect the satisfaction of people who have high scores on the Independence need of the MIQ, but it will have little effect on people who have low scores.

The multiple ranking form (MRO5) consists of two sections: a ranked section and an absolute zero section. In the ranked section, stimuli are grouped into a *balanced incomplete block* in which each stimulus is paired with every other stimulus an equal number of times. The 21 statements are presented in 21 blocks. Each block has five statements. Within each block, respondents rank-order the statements according to the relative importance of the needs on their ideal jobs. Each need appears in five blocks and with every other need exactly once. Using this format, 210 paired comparisons can be reduced to 21 blocks of 5 stimuli each. This format produces profiles similar to those provided using the paired-comparison form, and reduces administration time and the number of judgments required of respondents (Rounds, Miller, & Dawis, 1978).

The responses in this first part of the MIQ indicate the *relative* importance of the 21 needs. That is, the scoring thus far is ipsative. The scores do not show the *absolute* importance of each need. For some people, however, only a few needs are important; for others, most needs are important. Therefore, the second part of the MIQ asks the respondents to rate each need as either *important* or *not important*. This places each need on an absolute scale. Possible scores range from –4.00 to +4.00, although each *person's* scores will have a range no greater than 4.00.

Because each need appears in five different blocks, a respondent's consistency can be computed. The following example demonstrates inconsistent responding: Need A is ranked higher than Need B, Need B is ranked higher than Need C, and Need C is ranked higher than Need A. This

is called a *circular triad.* Within the MIQ, there are 440 triads of needs. For the MIQ, the percentage of circular triads (PCT) is computed as the percentage of the 440 triads that are circular. The converse of this statistic is the *coefficient of consistency*, which is the proportion of triads that are *not* circular. If the coefficient of consistency is less than .50, then it is assumed that the respondent is either responding carelessly or is unsure of the importance of his or her needs. Score results for the MIQ include scores on the 21 needs, scores on the six values, and the percentage of circular triads (Rounds et al., 1978).

The MIQ was not selected as one of the tools for direct use in the O*NET program because of several factors. First, the items on the instrument did not fit exactly with the work values information included in the O*NET model. It was a prime objective of the USDOL to provide opportunities for clients to use their results (profiles) to explore occupations in O*NET. More importantly, an instrument that could be self-scored, self-administered, and self-interpreted was critical to the practical success of the effort. The MIQ requires complex, and thus machine, scoring. As a result, feedback was not immediately available. Still, the MIQ served as an excellent basis for the development of the O*NET Work Values assessment instrument.

The following chapters describe the Pre-Pilot, Pilot, and Main studies conducted to develop the WIP-C.

# Chapter 2. Overall Research Design for Developing the WIP-C

## Introduction

This chapter describes the research design for developing the WIP-C (Computerized Work Importance Profiler) which involved three studies: a Pre-Pilot Study, a Pilot Study, and a Main Study. Data for these studies were collected at four points in time (referred to as Time 1, Time 2, Time 3, and Time 4) as shown in Table 1. Table 1 also shows the sample size (i.e., number of respondents) involved in each of the phases of the project. Each phase of the research design is discussed briefly below and in greater detail in the following chapters.

## Pre-Pilot Study to Develop New Measure

Prior to the Pre-Pilot Study at Time 1, a draft version of the WIP-C was developed using items from the MIQ as a basis. The WIP-C was first administered to several contractor employees. Modifications were made as a result of this testing. Next, internal staff members at the New York and North Carolina Assessment Research and Development Centers (ARDCs) completed the WIP-C and provided feedback on the draft. HumRRO staff then modified the profiler again based on the feedback. A total of 10 HumRRO and ARDC staff members were involved in the pre-pilot of the WIP-C. More detailed information about the Pre-Pilot is provided in Chapter 3.

## Pilot Study to Refine New Measure

The purpose of the Pilot Study (Time 2) was to get feedback and information useful for further refinement of the WIP-C. Forty-three employment center participants took the WIP-C at an employment center in Utah. Administrators observed participants completing the instruments, and then the participants completed Participant Reaction Questionnaires. Once again, comments from the questionnaires were used to guide modifications to the WIP-C. More detailed information about the Pilot Study is provided in Chapter 3.

*Table 1.* Sample and Subsample Sizes for the Research Project

| Study | Time 1 *n* per Subsample | Time 2 *n* per Subsample | Time 3 *n* per Subsample | Time 4 *n* per Subsample | Total *n* in Study |
|---|---|---|---|---|---|
| Pre-Pilot | 1. C = 10 | | | | C+P = 31 |
| | 2. P = 21 | | | | |
| Pilot | | 3. C = 43 | | | C+P = 91 |
| | | 4. P = 48 | | | |
| | | | | | |
| Main Study: Test-Retest | | | 5. P-C=148-133 | 5. P-C=121-111 | C=213 |
| | | | 6. C-P=132-142 | 6. C-P=102-111 | P=232 |
| | | | | | |
| Main Study: Other Analyses | | | 5. P-C=148-133 | | C=941 |
| | | | 6. C-P=132-142 | | P=1199 |
| | | | 7. P-C=269-210 | | MIQ=550 |
| | | | 8. C-P=218-276 | | |
| | | | 9. P-MIQ-174+141 | | |
| | | | 10. MIQ-P=158-190 | | |
| | | | 11. C-MIQ=120-121 | | |
| | | | 12. MIQ-C=130-128 | | |

*Note.* C = WIP-C, P = WIL-P&P. Unique subsamples of subjects are numbered 1–12; the numbers 5 and 6 refer to two subsamples who completed the WIL-P&P and WIP-C at both Times 3 and 4. The numbers shown after the measure labels are the number of people included in the analyses for those instruments. For example, in subject group 12, 130 MIQ cases and 128 WIP-C cases were used in the analyses; these subjects took the MIQ first, immediately followed by the WIP-C. Some completed measures were excluded from analyses due to excessive response inconsistency (> 50%), any missing or invalid responses, or more than one math error during self-scoring.

## Main Study: Psychometric Properties of the New Measure

Data for the Main Study on the WIP-C were collected at Times 3 and 4. In this Main Study, the WIL-P&P, WIP-C, and MIQ were administered to employment center clients and junior college students. Respondents in the Main Study took two of the three instruments (WIL-P&P, WIP-C, MIQ) so that information on the same respondents taking different measures would be available. The design attempted to balance the pairing and ordering of measures taken by respondents so that all pairs and orders would be represented.

The subsamples of respondents numbered 5 and 6 in Table 1 were junior college students who took both the WIL-P&P and WIP-C at Times 3 and 4. These data were used to examine the test-retest reliability of the instruments. For the test-retest reliability analyses, the sample size was 232 for the WIL-P&P and 213 for the WIP-C. Time 3 data from these students and Time 3 data from employment center clients (subsamples 7 through 12 in Table 1) were used to analyze other psychometric properties of the profiles, including: a) descriptive statistics on respondents, items, and value scales; b) comparative statistics for the three measures (WIP-C, WIL-P&P, and MIQ); c) response consistencies and errors; d) completion times; e) relationships of values to education;

f) racial/ethnic group; g) gender; h) consistency of needs and values expressed on the measures; i) internal consistency within measures; and j) factor analyses of how need items group together into values. Based on Time 3 data, the overall sample sizes in the Main Study for these analyses were 1,199 for the WIL-P&P, 941 for the WIP-C, and 550 for the MIQ.

Chapters 4 through 8 of this report discuss the data and results from this Main Study. Chapter 4 discusses the sample of respondents included in analyses and presents descriptive statistics on the respondents. Chapter 5 presents descriptive statistics for the WIP-C. Chapter 6 discusses the relationships between respondents' reported values and their educational level, racial/ethnic group, and gender. Chapter 7 provides information on the reliability of the WIP-C and discusses results of different types of reliability analyses. Chapter 8 presents results of exploratory and confirmatory factor analyses used to assess the construct validity of the WIP-C.

# Chapter 3. Development of the WIP-C in the Pre-Pilot and Pilot Studies

## Introduction

This chapter describes the initial reasoning and development of the WIP-C and its relationship to the MIQ and O*NET. Revisions to the items from the original MIQ are explained. Development of the computer instructions is also described in this chapter.

## Purpose

Because of the complexity of the MIQ's scoring, a completed MIQ answer sheet must be sent to the publisher to be scored. One purpose of this project was to develop work values measures that could be scored immediately. A second purpose was to develop measures of work values which could be used for self-assessment. The WIP-C is administered by computer and provides immediate scoring and information for use in self-assessment. On the WIP-C, the original wording of a few items from the MIQ was changed. These changes were made to be consistent with the O*NET occupational descriptors (see Table 2).

## Initial Development of the WIP-C

Goals in developing the WIP-C were to: a) use the MIQ items as revised by O*NET; b) make the program easy to use for people inexperienced with computers, and c) report the scores immediately. The WIP-C is administrated by a PC running the Windows operating system. The WIP-C program is written in Visual Basic 3.0.

The format of the WIP-C is based on the format of the MIQ and uses a multiple rank order 5 (MRO5) item format. After going through some instructions on using the keyboard and completing the measure, the respondent is presented with 21 screens. At the beginning of each screen, the stem prompt, "On my ideal job it is important that...," is provided. Each screen shows five need statements. An example of a set of five need statements is as follows:

- "My pay would compare well with that of others.
- I could do things for other people.
- I could be busy all the time.
- I could try out my ideas.
- The job would provide an opportunity for advancement."

The respondent ranks the five statements in order of importance and then proceeds to the next screen. After completing the 21 screens, the respondent rates each need statement as either *important* or *not important*. The wording of the WIP-C items matches that of O*NET (see Table 2). Hence, the WIP-C wording is different from the MIQ wording for several items. When the ratings are completed, the respondent's scores on the six work values are shown on the screen.

*Table 2.* WIP-C Wording Changes from the O*NET Project

| WIP-C | Original MIQ Items | Reasons for Change Made |
|---|---|---|
| 1. On my ideal job it is important that I make use of my abilities.[1] | 1. On my ideal job it is important that I could do something that makes use of abilities. | MIQ/MJDQ nonparallel. Follow MJDQ and O*NET |
| 2. On my ideal job it is important that the work could give me a feeling of accomplishment. [1] | 2. On my ideal job it is important that the job could give me a feeling of accomplishment. | Work consists of tasks that are done on a job. It is more clear and less redundant |
| 3. On my ideal job it is important that I could be busy all the time. | 3. On my ideal job it is important that I could be busy all the time. | |
| 4. On my ideal job it is important that the job would provide an opportunity for advancement. | 4. On my ideal job it is important that the job would provide an opportunity for advancement. | |
| 5. On my ideal job it is important that I could give directions and instructions to others. [2] | 5. On my ideal job it is important that I could tell people what to do. | Consistent with O*NET |
| 6. On my ideal job it is important that I would be treated fairly by the company. [2] | 6. On my ideal job it is important that the company would administer its policies fairly. | Consistent with O*NET |
| 7. On my ideal job it is important that my pay would compare well with that of other workers. | 7. On my ideal job it is important that my pay would compare well with that of other workers. | |
| 8. On my ideal job it is important that my co-workers would be easy to get along with. [2] | 8. On my ideal job it is important that my co-workers would be easy to make friends with. | Consistent with O*NET |
| 9. On my ideal job it is important that I could try out my own ideas.[1] | 9. On my ideal job it is important that I could try out some of my own ideas. | MIQ/MJDQ items non-parallel. Follow MJDQ wording |
| 10. On my ideal job it is important that I could work alone. [1] | 10. On my ideal job it is important that I could work alone on the job. | Reduce redundancy |
| 11. On my ideal job it is important that I would never be pressured to do things that go against my sense of right and wrong. [3] | 11. On my ideal job it is important that I could do the work without feeling that it is morally wrong. | Consistent with O*NET |
| 12. On my ideal job it is important that I could receive recognition for the work I do. [1] | 12. On my ideal job it is important that I could get recognition for the work I do. | O*NET change MIQ/MJDQ items non-parallel. Follow MJDQ wording |

*Table 2.* WIP-C Wording Changes from the O*NET Project (Continued)

| WIP-C | Original MIQ Items | Reasons for Change Made |
|---|---|---|
| 13. On my ideal job it is important that I could make decisions on my own. | 13. On my ideal job it is important that I could make decisions on my own. | |
| 14. On my ideal job it is important that the job would provide for steady employment. | 14. On my ideal job it is important that the job would provide for steady employment. | |
| 15. On my ideal job it is important that I could do things for other people. | 15. On my ideal job it is important that I could do things for other people. | |
| 16. On my ideal job it is important that I would be looked up to by others in my company and my community. [2] | 16. On my ideal job it is important that I could be "somebody" in the community. | Consistent with O*NET |
| 17. On my ideal job it is important that I have supervisors who would back up their workers with management.[1] | 17. On my ideal job it is important that my boss would back up the workers (with top management). | Consistent with O*NET |
| 18. On my ideal job it is important that I would have supervisors who train workers well. [1] | 18. On my ideal job it is important that my boss would train their workers well. | Consistent with O*NET |
| 19. On my ideal job it is important that I could do something different every day. | 19. On my ideal job it is important that I could do something different every day. | |
| 20. On my ideal job it is important that the job would have good working conditions. | 20. On my ideal job it is important that the job would have good working conditions. | |
| 21. On my ideal job it is important that I could plan my work with little supervision. | 21. On my ideal job it is important that I could plan my work with little supervision. | |

[1]Minor difference in the wording between WIP-C and MIQ.
[2]Moderate difference in the wording between WIP-C and MIQ.
[3]Substantial difference in the wording between WIP-C and MIQ.

## Pre-Pilot Study for the WIP-C

In the Pre-Pilot Study, the WIP-C was first completed by several contractor employees. Modifications were made as a result of this testing. Next, the WIP-C was completed by a few employees at the Department of Labor Assessment Research and Development Centers (ARDCs) in New York and North Carolina. In all, 10 individuals took the WIP-C and provided feedback during this Pre-Pilot.

The following major modifications were made after receiving feedback from the ARDC employees:

- Keyboard training was added to the program.
- A guided sample question was added to the program.
- The program was modified so that all respondent input would be via the keyboard. Most mouse functions were disabled.
- Apparent bugs were fixed.
- The output data file was modified to include more complete information.
- The order of the items was adjusted to ensure that each item appeared: a) on the same screen with each of the other items only once, and b) in each of the five positions within the screens (i.e., top line, 2nd line, 3rd line, 4th line, 5th line) exactly once. The MIQ has a few violations of these two rules.
- Programs were written to automate the WIP-C program installation and data-backup procedures.

## Pilot Study for the WIP-C

The next phase of instrument development was the Pilot Study. Forty-three employment center participants took the WIP-C at an employment center in Utah. Test administrators observed the participants completing the measure. When finished, the participants completed a participant reaction form. On the form, participants supplied written comments about the WIP-C and rated the WIP-C on its ease of use. Results of the analyses of participants' reactions for the computerized profiler are shown in Table 3.

The test administrators made the following observations during WIP-C pilot administration:

- Most participants completed the task without difficulty.
- Some participants who had never used a keyboard (e.g., "what is a space bar," "I typed E-S-C instead of pressing the <Escape> Key") made basic mistakes.
- Some participants expressed frustration at seeing each item several times.
- Average completion time was 17 minutes, with a range of 8–30 minutes.

*Table 3.* Participant Reaction Results from the Pilot Study – Computer Version (*N* = 43)

| Evaluation Question | Percent Positive Reaction Responses |
|---|---|
| How clear were the instructions on the survey? | 96% |
| Did you find the rankings easy to do? | 92% |
| Was the explanation of which keyboard key to use (the sorting task) clear? | 98% |
| At any time...did you have difficulty knowing what to do? | 81% |
| Did you get tired or bored at any time during the survey? | 85% |
| Are the results of the survey consistent with how you would describe yourself? | 86% |

## Final Revisions

Pilot Study information was used to modify the WIP-C for use in the Main Study. The installation and data-backup programs were modified to simplify procedures. In addition, a printed keyboard layout was provided during the Pilot Study to help the participants find the required keys. The final version of the WIP-C contained the following sections, in order:

- *Introductory screens*—These screens identify the program, briefly introduce its purpose, and indicate the copyright date.
- *Mouse and keyboard training*—These screens explain how to use the mouse and/or keyboard within this program.
- *Identification block*—the program requests optional user identification information.
- *Guided ranking example and ranking instructions*—The program presents an example to show the individual completing the profiler how to select options to indicate one's order of preference.
- *Ranking the items on relative importance (21 blocks of 5 items)*—The program presents 21 screens, each having 5 statements expressing values about work characteristics and environments. The top of the screen indicates which screen the user is currently viewing (e.g., "Screen 1 of 21"). This gives the individual completing the program information about how far they have progressed and how many screens remain. The individual ranks the five statements using the spacebar and delete keys in answer to the following stem prompt: "On my ideal job it is important that...."

- An example of the statements on one screen is:

- "My pay would compare well with that of others.
- I could do things for other people.
- I could be busy all the time.
- I could try out my ideas.
- The job would provide an opportunity for advancement."

Individuals can change their answers within a screen. They can also review their rankings on all 21 screens if they want.

- *Rating instructions*—The program indicates that the individual has completed ranking and will now be asked to "decide which job characteristics are really important to you." The individual is allowed to select as many or as few characteristics as he or she wants.

- *Rating the 21 items on absolute importance*—The individual uses the mouse or the 'Y' and 'N' keys for each of the 21 items to indicate whether it is *important* or *not important*. The 21 items are the same items which were used in the ranking screens (e.g., "My pay would compare well with that of others").

- *Score feedback*—Scaled scores on the six values are displayed on the screen. The individual is instructed to copy down the six numerical scores, one for each of the six work values scales as well as their 21 need scores. The 21 need scores are sorted based on which needs are associated with each work value. Additionally, their individual need scores are also presented under each work value. The individual is then instructed, "Please let the test administrator know that you are finished. Thanks again for your participation." *(Note: Modifications were made to the presentation of this information to enhance ease of use in the final version of the WIP.)*

- *A Work Values Explanation sheet*—This one-page sheet tells respondents how to interpret their scores (see Appendix A). It explains again that the purpose of the WIP-C is to measure work values to help match people with jobs. It provides boxes in which to record the six scores from the computer screen (and the need scores associated with each particular work value) and, next to each box, presents a paragraph naming and describing the work values. *(Note: This information is presented within the computer program itself in the final version of the WIP.)*

When the WIP-C program (network version) is executed, it appends the data for the current respondent to the data file (which is stored as an ASCII text file). The file layout is shown in Appendix B. The derivation of the scoring algorithm used for the WIP-C and the MIQ is in Appendix C.

## Summary

The WIP-C was developed using items from the MIQ, some of which were reworded during the O*NET project. The Pre-Pilot and Pilot Studies were conducted to gain information to improve the measure before administering it to a larger sample. Many improvements were made based on feedback from these two preliminary studies. With the completion of the Pre-Pilot Study and Pilot Study and modification of the measure and accompanying materials based on the results of these studies, the WIP-C was considered ready for use in the Main Study.

Following the Main Study, further modifications were made to the WIP-C to improve ease of use and delivery of information provided by the program. Please refer to the O*NET Work Importance Profiler User's Guide for a description of the final instrument.

# Chapter 4. Main Study: Sample Description and Data Cleaning

## Introduction

This chapter describes the creation of the dataset and the characteristics of the respondents in the Main Study. Various frequencies and descriptive statistics are reported that describe the sample both before and after the data-cleaning process. The data-cleaning process is used to identify and correct problems in the data which are due to errors, incorrect coding, careless responding, or other factors that can lead to erroneous conclusions in analyses.

## Construction of the Dataset

Table 4 shows the number of subsamples of respondents who participated and provided complete, useable data at Times 3 and 4 in the Main Study. The construction of the database of information from these respondents was complex. The data were collected at 23 sites over a period of 3 months. MIQ forms, completed by 550 respondents, were sent together to be computer-scored by the MIQ publisher. The data from the 941 completed WIP-Cs were copied onto floppy disks at each administration site at the end of each day. All other data (roster, biodata, and 1,199 completed WIL-P&P forms) were entered manually by National Center for O*NET Development personnel. There was a separate file for each combination of site and form. The data at this stage consisted of the following data files:

- WIP-C files,
- MIQ files,
- WIL-P&P files,
- biodata form files, and
- roster files.

The data from these files had to be combined to create one large dataset. Participants' Social Security numbers (SSNs) served as the linking variable. Errors in the data were corrected before merging. Common errors included incorrect SSNs and incorrect coding of whether or not the test administration was a retest.

Some respondents' results were excluded from the dataset to prevent the responses of careless or unmotivated participants from distorting the analyses. There were a few cases where the test administrator concluded that a respondent was completely unable or unwilling to complete a measure. These forms were discarded and, consequently, their data were not used. The number of times this happened was not recorded. Although the number of people who had *all* their results discarded is unknown, informal reports suggest that it was very few. It was possible, however, to identify the number of people who had only *one* measure discarded. After excluding these results and merging data files by participants' SSNs, there were 1,609 people in the total dataset; of these, 941 (58.5 percent) had useable WIP-C data.

*Table 4.* Sample and Subsample Sizes for the Main Study

| Study | Time 1 *n* per Subsample | Time 2 *n* per Subsample | Time 3 *n* per Subsample | Time 4 *n* per Subsample | Total *n* in Study |
|---|---|---|---|---|---|
| Main Study: Test-Retest | | | 5. P-C=121-111 | 5. P-C=121-111 | C-213 |
| | | | 6. C-P=132-142 | 6. C-P=102-111 | P=232 |
| | | | | | |
| Main Study: Other Analyses | | | 5. P-C=148-133 | | C=941 |
| | | | 6. C-P=132-142 | | P=1,199 |
| | | | 7. C-P=218-276 | | MIQ=550 |
| | | | 8. C-P=218-276 | | |
| | | | 9. P-MIQ=174-141 | | |
| | | | 10. MIQ-P=158-190 | | |
| | | | 11. C-MIQ=120-121 | | |
| | | | 12. MIQ-C=130-128 | | |

## Characteristics of the Respondents Before Data Cleaning

All measurement sites implemented procedures to ensure adequate numbers of respondents from each of the following gender and racial/ethnic groups: male, female, White, Hispanic, and African American. All sites also took steps to ensure that there were enough respondents for each pair of measures. These subgroup sample sizes for the Main Study are shown in Table 5. The figures shown in the table and discussed below represent the people in the dataset *before* data cleaning.

In the Main Study, representation by racial/ethnic group and gender was well balanced across the three pairs of measures (C-P, C-MIQ, P-MIQ). There were no meaningful differences in percent representation by gender or employment situation across the three pairs of measures. There were some differences by racial/ethnic group: in the P-MIQ pair, there were relatively more Whites and fewer African Americans. Overall the sample was 45 percent female, 45 percent African American, 26 percent White, and 18 percent Hispanic. The respondents' employment situation was equally represented across the three pairs of measures, as well (see Table 6). The largest group consisted of employment center customers, who represented 42 percent of the sample.

For the dataset used in the analysis of test-retest reliabilities, representation was well balanced (see Tables 7 and 8). There were no meaningful differences among the three measures in percent representation by gender, racial/ethnic group, or employment situation. The sample was 70 percent female, 25 percent African American, 66 percent White, and 7 percent Hispanic. The majority (66 percent) listed Junior College Student as their employment situation. There were substantial differences between the test-retest sample and the sample used for the rest of the Main Study in all these percentages. This was not surprising considering that the majority of respondents in the Main Study had taken the need/value measures at employment centers, whereas the test-retest reliability analysis was based on a subsample of respondents who took the need/value measures at junior colleges.

Overall, for the Main Study, the mean age of the sample was 35 years, and the mean years of education was 13 (see Table 9). The test-retest reliability subsample was similar; the average age was 32 years, and the mean years of education was 13. There were no large differences in age and education among the design subsamples.

*Table 5.* Main Study Subsample Sizes and Percentages by Gender and Racial/Ethnic Group (Before Data Cleaning)

| | | Gender | | Racial/Ethnic Group | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Measures | Row Total | F | M | Af. Amer. | Hispanic | White | Am. Indian | Asian | Other |
| | | | | | Subsample Sizes | | | | |
| C – P | 598 | 260 | 336 | 294 | 80 | 199 | 5 | 8 | 8 |
| C – MIQ | 321 | 147 | 172 | 161 | 44 | 105 | 2 | 2 | 7 |
| P – MIQ | 389 | 184 | 204 | 132 | 71 | 167 | 5 | 4 | 9 |
| All | 1308 | 591 | 712 | 587 | 195 | 471 | 12 | 14 | 24 |
| | | | | | Percentages | | | | |
| C – P | 100% | 44% | 56% | 49% | 13% | 34% | <1% | 1% | 1% |
| C – MIQ | 100% | 46% | 54% | 50% | 14% | 33% | <1% | <1% | 2% |
| P – MIQ | 100% | 47% | 53% | 34% | 18% | 43% | 1% | 1% | 2% |
| All | 100% | 45% | 55% | 45% | 15% | 36% | <1% | 1% | 2% |

*Note.* C is the WIP-C; P is the WIL-P&P. Some row frequency values do not sum to the total because of missing values. The table includes all people scheduled for only one administration of the measures (including people whose measures were eliminated from subsequent analyses). That is, this table excludes people scheduled for the test-retest group.

*Table 6.* Main Study Subsample Sizes and Percentages by Employment Situation (Before Data Cleaning)

| Subsamples: | | Employment Situation | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Measures | Row Total | Employment Service | Junior College | Em-ployed | Unem-ployed | Com-munity Group | High School Student | Military Service | Other |
| | | | | | Subsample Sizes | | | | |
| C – P | 598 | 241 | 30 | 84 | 82 | 0 | 13 | 5 | 137 |
| C – MIQ | 321 | 126 | 10 | 36 | 45 | 1 | 6 | 1 | 88 |
| P – MIQ | 389 | 171 | 18 | 54 | 45 | 1 | 6 | 1 | 88 |
| ALL | 1308 | 538 | 58 | 174 | 172 | 2 | 25 | 7 | 313 |
| | | | | | Percentages | | | | |
| C – P | 100% | 41% | 5% | 14% | 14% | 0% | <1% | <1% | 28% |
| C – MIQ | 100% | 40% | 3% | 12% | 14% | <1% | 2% | <1% | 28% |
| P – MIQ | 100% | 45% | 5% | 14% | 12% | <1% | 2% | <1% | 23% |
| ALL | 100% | 42% | 4% | 13% | 13% | <1% | 2% | <1% | 24% |

*Note.* C is the WIP-C; P is the WIL-P&P. Some row frequency values do not sum to the total because of missing values. The table includes all people scheduled for only one administration of the measures (including people whose measures were eliminated from subsequent analyses).

*Table 7.* Test-Retest Analyses Subsample Sizes and Percentages by Gender and Racial/Ethnic Group (Before Data Cleaning)

| Time | Row Total | Gender | | Racial/Ethnic Group | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | M | Af. Amer. | Hispanic | White | Amer. Indian | Asian | Other |
| | | | | Subsample Sizes | | | | | |
| Time 1 | 301 | 201 | 98 | 78 | 23 | 192 | 2 | 2 | 4 |
| Time 2 | 240 | 167 | 72 | 61 | 16 | 158 | 1 | 1 | 1 |
| | | | | Percentages | | | | | |
| Time 1 | 100% | 67% | 33% | 26% | 8% | 64% | <1% | <1% | 1% |
| Time 2 | 100% | 70% | 30% | 25% | 7% | 66% | <1% | <1% | 1% |

*Note.* Some row frequency values do not sum to the total because of missing values. The table includes all people scheduled for two administrations of the measures (including people whose results were eliminated from subsequent analyses). For these people, the two measures taken at each administration were the WIL-P&P and the WIP-C.

*Table 8.* Test-Retest Analyses Subsample Sizes and Percentages by Employment Situation (Before Data Cleaning)

| Time | Total | Employment Situation | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Employment Service | Junior College | Em-ployed | Unem-ployed | Com-munity Group | High School Student | Military Service | Other |
| | | | | | Subsample Sizes | | | | |
| Time 1 | 301 | 6 | 196 | 45 | 30 | 1 | 3 | 1 | 18 |
| Time 2 | 240 | 6 | 158 | 36 | 20 | 1 | 3 | 0 | 15 |
| | | | | | Percentages | | | | |
| Time 1 | 100% | 2% | 65% | 15% | 10% | <1% | 1% | <1% | 6% |
| Time 2 | 100% | 3% | 66% | 15% | 8% | <1% | 2% | 0% | 6% |

*Note.* Some row frequency values do not sum to the total because of missing values. The table includes all people scheduled for two administrations of the measures (including people whose measures were eliminated from subsequent analyses). For these people, the two measures taken at each administration were the WIL-P&P and the WIP-C.

*Table 9.* Descriptive Statistics for Age and Education (Before Data Cleaning)

| | Age (in years) | | Education (in years) | |
|---|---|---|---|---|
| Measure Design Group | No-Retest Group | Test-retest Group | No-Retest Group | Test-retest Group |
| C – P | | | | |
| *M* | 35.6 | 31.0 | 12.5 | 12.7 |
| *SD* | 11.3 | 10.7 | 2.1 | 1.9 |
| *N* | 303 | 147 | 300 | 145 |
| P – C | | | | |
| *M* | 36.8 | 33.1 | 12.5 | 12.4 |
| *SD* | 11.0 | 10.5 | 1.9 | 1.7 |
| *N* | 293 | 153 | 290 | 154 |
| C – MIQ | | | | |
| *M* | 36.7 | | 13.0 | |
| *SD* | 11.0 | | 1.8 | |
| *N* | 154 | | 153 | |
| MIQ - C | | | | |
| *M* | 35.9 | | 12.7 | |
| *SD* | 12.1 | | 1.8 | |
| *N* | 167 | | 165 | |
| P – MIQ | | | | |
| *M* | 36.7 | | 12.9 | |
| *SD* | 12.8 | | 2.1 | |
| *N* | 190 | | 187 | |
| MIQ - P | | | | |
| *M* | 36.6 | | 12.6 | |
| *SD* | 11.6 | | 2.0 | |
| *N* | 198 | | 197 | |

*Note*. C is the WIP-C; P is the WIL-P&P. The *n* values represent the number of non-missing values for age or education in each cell of the design.

## Data Cleaning Based on Response Irregularities

The initial analyses examined response inconsistencies, missing responses, invalid responses, and errors in self-scoring (see Table 10). These will be called *response irregularities* in the remainder of the report. A total of 1,609 individuals participated in the Main Study. This does not include people who had all their results discarded by the test administrator because the test administrator concluded that these respondents were completely unable or unwilling to complete the measures, as discussed earlier. Because its administration was computerized, the WIP-C had no missing or invalid responses.

It was decided that the data analyses should be based, as much as possible, upon measures that were properly completed by motivated respondents. The following criteria were used to omit additional data from the analyses:

For the MIQ

- consistency $\leq .5$
- any missing values (the MIQ publisher does not score measures with any missing values)
- any invalid values (the MIQ publisher does not score measures with any invalid values)

For the WIP-C

- consistency $\leq .5$

For the WIL-P&P

- any missing values
- any invalid values
- more than one math error during self-scoring

The approach taken when determining the screening criteria was to ensure, as much as possible, that responses on the measures were true reflections of the respondents' attitudes. Therefore, stringent screening standards were used. The response consistency cutoff of .50 is about three standard deviations above the level for random responding (which is .16). In addition, the MIQ publisher uses the same cutoff of .50 and considers people with lower consistencies either to have poorly defined values or be responding carelessly.

It was assumed that an invalid or missing response was also evidence of carelessness. Therefore, measures with any invalid or missing responses were excluded. On the other hand, it was assumed that the presence of a *single* math error during the WIL-P&P's self-scoring process was *not* due to carelessness, but that the presence of *more* than one math error *was* due to carelessness. This assumption was supported by the finding that many respondents (14 percent) made one math error, whereas fewer respondents (3 percent) had a missing or invalid response or more than one math error (5 percent). To prevent respondents' math errors from affecting any analyses, the work values scale scores were calculated by the computer when creating the dataset.

Several analyses showed that the presence of response irregularities in one of a respondent's measures had little relation to the presence or absence of response irregularities in his or her other measure. Therefore, data were screened out on a measure-by-measure basis. That is, the data for a respondent might be screened out for one measure but kept for another. Data below are presented for all measures included in this study.

*Table 10.* Frequency of Respondents in Main Study with Response Irregularities

| | Number of Respondents | | | Percent of Total | | |
|---|---|---|---|---|---|---|
| Type of Response Irregularity | WIL-P&P | WIP-C | MIQ | WIL-P&P | WIP-C | MIQ |
| Consistency $\leq .5$ | | 264 | 105 | | 21.6 | 14.8 |
| 1 Missing | 9 | | 0 | 0.7 | | 0.0 |
| >1 Missing | 11 | | 5 | 0.9 | | 0.7 |
| 1 Invalid | 11 | | 0 | 0.9 | | 0.0 |
| > 1 Invalid | 5 | | 44 | 0.4 | | 6.2 |
| 1 Addition Error | 148 | | | 11.5 | | |
| > 1 Addition Error | 61 | | | 4.7 | | |
| 1 Multiplication Error | 110 | | | 8.5 | | |
| > 1 Multiplication Error | 59 | | | 4.6 | | |
| 1 Math Error | 180 | | | 14.0 | | |
| > 1 Math Error | 66 | | | 5.1 | | |
| Measure Discarded by Administrator | 5 | 15 | 6 | 0.4 | 1.2 | 0.8 |
| Total Respondents | 1,288 | 1220 | 710 | 100 | 100 | 100 |
| Useable Respondents | 1,199 | 941 | 550 | 93.1 | 77.1 | 77.5 |

*Note*. Numbers in the WIL-P&P column do not sum to the total because some respondents had more than one type of response irregularity. Any miscalculation of a WIL-P&P value scale score was considered a *Math Error*. There were 1,609 individual respondents in Study 2.

## Characteristics of the Respondents After Data Cleaning

As just described, suspect data were screened out on a measure-by-measure basis. That is, a respondent could have one measure excluded from the analyses but the other measure included. Therefore, the frequencies and descriptive statistics are presented by instrument because the number of subjects changes depending on the instrument.

Table 11 shows the final subsample sizes by gender and racial/ethnic group. For a direct comparison of the changes in the WIP-C sample after data cleaning, Table 12 provides the number of respondents across gender and racial/ethnic group by measure for Time 1 and Time 2 before data cleaning. The comparison shows that 279 of the original 1,220 respondents (23 percent) were removed during data cleaning. The distributions of gender and racial/ethnic group changed slightly after data cleaning. At Time 1, the proportion of females increased 3 percentage points and the proportion of Whites increased 6 percentage points. In addition, the percentages for Whites and African Americans reversed. Before the data cleaning, the sample was 44 percent African American and 41 percent White; after the data cleaning, the sample was 37 percent African American and 47 percent White. Although subject loss was disproportionately high for African Americans, the final percentage of 37 percent provides an adequate subsample of African Americans for statistical comparisons. Note that at Time 2, the loss of data was quite evenly distributed across groups. The proportion of females increased 4 percentage points and the proportion of Whites increased 2 percentage points.

## Summary

Numerous data files from 23 sites were collected and combined into a single data set for analyses. Data were merged into this single data set through the use of respondents' SSNs. After the exclusion of tests that respondents were unable or unwilling to complete, the total number of respondents in the dataset was 1,609. Errors and incorrect coding were corrected before the data were merged. Some additional data were not used in analyses because response inconsistencies, missing values, invalid values, and scoring errors were found. There were 941 respondents with useable data on the WIP-C, 1,199 on the WIL-P&P, and 550 on the MIQ. Data collection sites had implemented procedures to ensure that adequate numbers of male, female, White, Hispanic, and African American respondents were included so that there would be large enough subsamples from these groups to do statistical analyses. Although the relative percentages of the various demographic subgroups did change somewhat after data cleaning, subgroups remained large enough for statistical analyses.

The next step in analyzing the data was to calculate descriptive statistics on the measures, sample, and subsamples. These statistics are presented in the next two chapters.

*Table 11.* Subsample Sizes and Percentages for Gender and Racial/Ethnic Group by Instrument and Time (after Data Cleaning)

| Group: | | Gender | | Racial/Ethnic Group | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Measures | Row Total | F | M | Af. Amer. | Hispanic | White | Amer. Indian | Asian | Other |
| Time 1 | | | | Subsample Sizes | | | | | |
| WIL-P&P | 1,199 | 606 | 588 | 454 | 157 | 539 | 12 | 14 | 19 |
| WIP-C | 941 | 496 | 440 | 351 | 113 | 441 | 8 | 12 | 14 |
| MIQ | 550 | 272 | 277 | 216 | 83 | 228 | 7 | 4 | 12 |
| Time 2 | | | | | | | | | |
| WIL-P&P | 232 | 163 | 68 | 59 | 16 | 152 | 1 | 1 | 3 |
| WIP-C | 213 | 150 | 62 | 49 | 14 | 146 | 1 | 1 | 2 |
| | | | | Percentages | | | | | |
| Time 1 | | | | | | | | | |
| WIL-P&P | 100% | 51% | 49% | 38% | 13% | 45% | 1% | 1% | 2% |
| WIP-C | 100% | 53% | 47% | 37% | 12% | 47% | 1% | 1% | 1% |
| MIQ | 100% | 50% | 50% | 39% | 15% | 41% | 1% | 1% | 2% |
| Time 2 | | | | | | | | | |
| WIL-P&P | 100% | 71% | 29% | 25% | 7% | 66% | <1% | <1% | 1% |
| WIP-C | 100% | 41% | 29% | 23% | 7% | 69% | <1% | <1% | 1% |

*Note*. Some row values do not sum to the total because of missing values in Gender or Racial/Ethnic group. Only one measure was used for some people because of excessive errors on their other measure. On the MIQ and WIP-C, measures with consistency $\leq .5$ were excluded from all analyses. On the WIL-P&P, measures with any missing values, any invalid entries, or more than one math error were excluded from all analyses.

*Table 12.* Subsample Sizes and Percentages for Gender and Racial/Ethnic Group by Instrument and Time (before Data Cleaning)

| Group: | | Gender | | Racial/Ethnic Group | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Measures | Row Total | F | M | Af. Amer. | Hispanic | White | Amer. Indian | Asian | Other |
| Time 1 | | | | Subsample Sizes | | | | | |
| WIL-P&P | 1,288 | 645 | 638 | 504 | 174 | 558 | 12 | 14 | 21 |
| WIP-C | 1,220 | 608 | 606 | 533 | 147 | 496 | 9 | 12 | 19 |
| MIQ | 710 | 331 | 376 | 293 | 115 | 272 | 7 | 6 | 16 |
| Time 2 | | | | | | | | | |
| WIL-P&P | 301 | 201 | 98 | 78 | 23 | 192 | 2 | 2 | 4 |
| WIP-C | 301 | 201 | 98 | 78 | 23 | 192 | 2 | 2 | 4 |
| | | | | Percentages | | | | | |
| Time 1 | | | | | | | | | |
| WIL-P&P | 100% | 50% | 50% | 39% | 13% | 43% | <1% | 1% | 2% |
| WIP-C | 100% | 50% | 50% | 44% | 12% | 41% | <1% | 1% | 2% |
| MIQ | 100% | 47% | 53% | 41% | 16% | 38% | <1% | <1% | 2% |
| Time 2 | | | | | | | | | |
| WIL-P&P | 100% | 67% | 33% | 26% | 8% | 64% | <1% | <1% | 1% |
| WIP-C | 100% | 67% | 33% | 26% | 8% | 64% | <1% | <1% | 1% |

*Note*. Some row values do not sum to the total because of missing values in Gender or Racial/Ethnic group

# Chapter 5. Main Study: Descriptive Statistics for the Instruments

## Introduction

This chapter presents the descriptive statistics for the WIP-C and the MIQ. The variables of interest from these instruments are the 21 need items and 6 value scales, instrument completion times, and response consistencies. Table 13 shows the means and standard deviations for the WIP-C and the MIQ. Figure 1 shows a plot of the mean profiles for each measure. Notice that the two profiles are very similar. The profiles differ substantially only on the items where the O*NET wording (which is used in the WIP-C) differs significantly from the MIQ wording. The five largest differences are on the five items with the most significant wording changes (Items 5, 16, 8, 11, and 6). Items 17 and 18 had smaller changes in wording, but their means also differ substantially on the two instruments. These seven items are in Values 3, 4, and 5 (i.e., Status, Altruism, Safety). In all cases, the MIQ score is lower. The mean scores on the three corresponding work values also differ considerably, probably as a consequence of the wording changes in items. Thus, respondents completing the WIP-C may get somewhat different value scores than those completing the original MIQ because of the use of the O*NET item wording in the WIP-C.

## Analysis of Effects of Completing Two Measures During the Same Administration

When a person responds to two very similar measures back-to-back, there is always a concern that the act of taking the first measure will affect the scores on the second measure. Increased fatigue, perseveration (i.e., attempting to answer the same way on both measures), decreased motivation, and true changes in the characteristic being measured can all systematically affect examinees' scores on the second of two similar measures when there is only a short interval between the administrations.

To examine the seriousness of these effects, results from the first measure that respondents completed were compared with results from the second measure they completed in terms of the response consistency for the MIQ and the WIP-C. Administration time was also examined to determine if there were drastic reductions in the time required to complete the second measure. The results of these analyses are given in Table 14.

In general, the order effects were minimal and indicated careful responding. For both the MIQ and the WIP-C, response consistency *increased* slightly for the measure administered second. Apparently, the respondents became more comfortable with the items being ranked and the ranking task itself. As expected, the time to take each measure decreased for the second administration, but this effect was also small.

*Table 13.* Main Study Need and Value Means and Standard Deviations

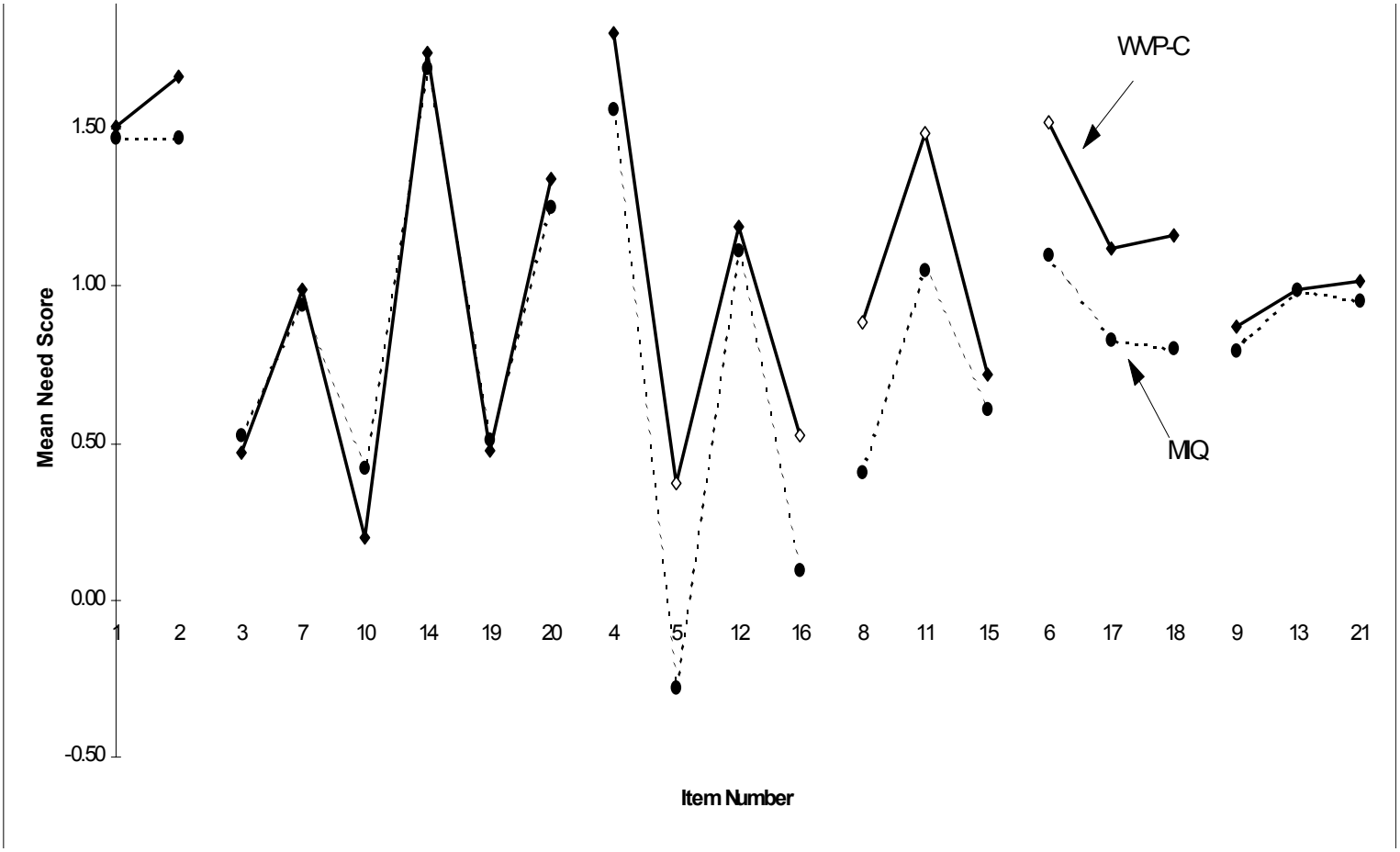
| Value | Item | Need Name | | WIP-C Mean | WIP-C Std. Dev. | MIQ Mean | MIQ Std.Dev. | MIQ-C Within Person Difference Score |
|---|---|---|---|---|---|---|---|---|
| 1. Achievement | 1 | Ability Utilization | | 1.51 | 0.74 | 1.47 | 0.71 | 0.01 |
| | 2 | Achievement | | 1.66 | 0.78 | 1.47 | 0.68 | -0.07 |
| 2. Comfort | 3 | Activity | | 0.47 | 0.98 | 0.53 | 0.88 | 0.03 |
| | 7 | Compensation | 0.99 | 0.97 | 0.94 | 0.91 | -0.06 | |
| | 10 | Independence | | 0.20 | 1.02 | 0.42 | 0.99 | 0.15* |
| | 14 | Security | | 1.74 | 0.88 | 1.70 | 0.89 | 0.03 |
| | 19 | Variety | | 0.48 | 0.88 | 0.51 | 0.77 | -0.04 |
| | 20 | Working Conditions | | 1.34 | 0.75 | 1.25 | 0.74 | -0.03 |
| 3. Status | 4 | Advancement | | 1.81 | 0.81 | 1.56 | 0.75 | -0.15* |
| | 5 | Authority | | 0.37 | 0.95 | -0.28 | 0.89 | -0.61*[a] |
| | 12 | Recognition | | 1.19 | 0.83 | 1.11 | 0.75 | -0.06 |
| | 16 | Social Status | | 0.52 | 0.96 | 0.10 | 1.00 | -0.30*[a] |
| 4. Altruism | 8 | Co-Workers | | 0.89 | 0.80 | 0.41 | 0.79 | -0.35*[a] |
| | 11 | Moral Values | | 1.49 | 1.05 | 1.05 | 1.08 | -0.37*[a] |
| | 15 | Social Service | 0.72 | 0.89 | 0.61 | 0.82 | -0.01 | |
| 5. Safety | 6 | Company Policies | 1.52 | 0.72 | 1.10 | 0.75 | -0.31*[a] | |
| | 17 | Supervision: Human Relations | | 1.12 | 0.81 | 0.83 | 0.75 | -0.24* |
| | 18 | Supervision: Technical | | 1.16 | 0.78 | 0.80 | 0.71 | -0.20* |
| 6. Autonomy | 9 | Creativity | | 0.87 | 0.80 | 0.80 | 0.75 | -0.10* |
| | 13 | Responsibility | 0.99 | 0.79 | 0.99 | 0.76 | 0.01 | |
| | 21 | Autonomy | | 1.02 | 0.78 | 0.95 | 0.72 | -0.01 |
| 1. Achievement | | | | 1.58 | 0.68 | 1.47 | 0.62 | -0.03 |
| 2. Comfort | | | | 0.87 | 0.62 | 0.89 | 0.56 | 0.02 |
| 3. Status | | | | 0.97 | 0.68 | 0.68 | 0.61 | -0.28* |
| 4. Altruism | | | | 1.03 | 0.65 | 0.69 | 0.64 | -0.24* |
| 5. Safety | | | 1.27 | 0.65 | 0.91 | 0.63 | -0.25* | |
| 6. Autonomy | | | | 0.96 | 0.70 | 0.91 | 0.65 | -0.03 |

* Mean difference score is significantly different from 0 at $p<.05$.

[a] Moderate or substantial differences in wording.

*Note*. For each instrument, scores on the retest were excluded. $N = 941$, and 550 for the WIP-C and MIQ, respectively. $N = 221$ for the MIQ-C mean difference score. The MIQ-C mean within person difference score is the mean of the within-subject difference between the MIQ and WIP-C scores

Figure 1. Profile of Mean Need Scores for the MIQ and WIP-C




*Note*. The plotted line for each instrument is broken into six segments. Each segment represents a different work value. Solid lines represent WIP-C (referred to above as WIP-C); items, and dotted lines represent MIQ items. Solid diamonds represent WIP-C items without wording changes compared to the MIQ, and hollow diamonds represent WIP-C items with significant wording changes compared to the MIQ. Notice that substantial differences between the two instruments tend to occur for these items.

Table 14 also shows that the WIP-C took the longest time to complete. When comparing the times, it is important to note that the WIP-C completion times include the time spent on keyboard training and the example screens.

Table 14. Mean Response Consistency and Completion Time by Order of Administration

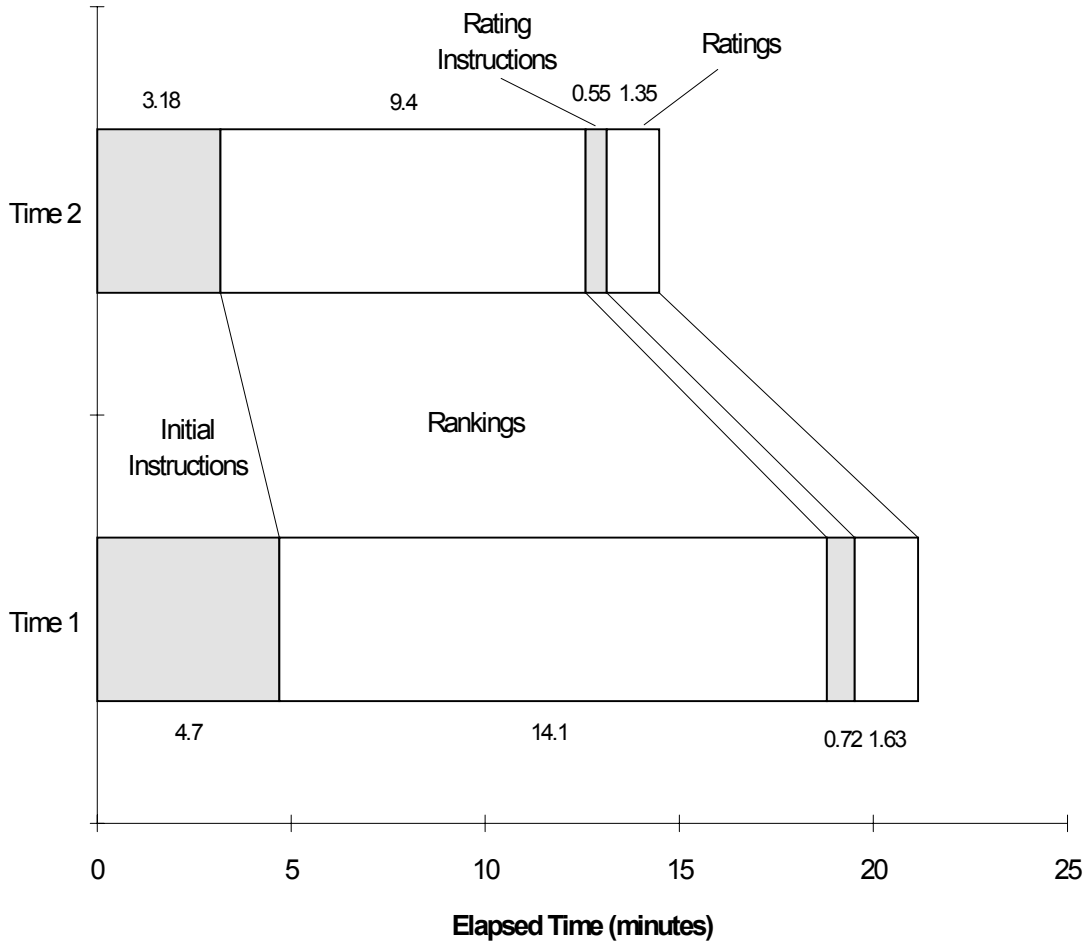
| | Consistency | | Completion Time | | |
|---|---|---|---|---|---|
| Measure Order | WIP-C | MIQ | WIP-C | MIQ | WIL-P&P |
| 1. WIP-C–MIQ | .82 | .87 | 23.5 | 15.3 | |
| 2. MIQ–WIP-C | .85 | .82 | 21.0 | 18.5 | |
| 3. WIL-P&P–MIQ | | .80 | | 17.8 | 10.3 |
| 4. MIQ–WIL-P&P | | .84 | | 17.6 | 11.3 |
| 5. WIP-C– WIL-P&P | .81 | | 24.6 | | 10.0 |
| 6. WIL-P&P–WIP-C | .84 | | 23.2 | | 11.4 |

*Note*. Sample sizes for the six measure orders are 108, 113, 333, 335, 155, and 134, respectively, for consistency and 93, 113, 128, 129, 154, and 134 for completion time. Measures that were discarded before data entry were not included in these analyses.

The time it took the test-retest participants to complete the WIP-C was broken down into the time to complete each section. Figure 2 shows that the instructions consumed a significant amount of time. This could explain why the WIP-C took longer than the MIQ to complete. The figure also shows that the WIP-C took about one-third less time to complete the second time; participants shaved the same proportion of time from both the instructions and the rankings.

Overall, the evidence indicates that the participants took the measures seriously. The consistencies and completion times remained relatively stable regardless of whether a measure was taken first or second. If participants became bored, one would expect the completion times and consistency to decrease substantially for the second measure. Though subjects may be recalling prior decisions (when taking the second measure), the drop in completion times for the second measure may be attributable to greater familiarity with the concepts and processes involved.

*Figure 2.* Median Completion Times for Sections of the WIP-C (Test-retest Group)




## Summary

Means on the WIP-C were somewhat different than those on the MIQ – probably because the WIP-C uses the O*NET item wording rather than the original MIQ wording. Results of the analyses showed that one can confidently use data from both the first and second instruments individuals completed at a single administration. The data do not indicate that individuals took the second instrument less seriously or showed greater fatigue based on response consistencies and completion times. Results on completion times indicate that the WIP-C does take somewhat longer to complete than the WIL-P&P or MIQ. The following chapters will provide additional information on which to evaluate the WIP-C.

# Chapter 6. Main Study: Relationships of Work Values with Gender, Racial/Ethnic Group, and Education

## Introduction

Several analyses were performed to determine if work values were related to gender, racial/ethnic group, or educational attainment. One of the analyses compared mean work values of respondents in groups divided by four levels of education: two or more years of college, some college but less than two years, a high school degree, and no high school degree. A second analysis compared mean work values between males and females and among Whites, African Americans, and those of Hispanic background. Results of these analyses are provided in the following sections.

## Education

A multivariate analysis of variance (MANOVA) was performed on each of the three instruments (MIQ, WIP-C, and WIL-P&P) to determine if the level of education affected the magnitude of the scores. The dependent variables were the six value scales, and the independent variable was the level of education. Table 15 shows the means on values for the six values measures.

The MANOVA was significant ($p<.0001$) for each of the instruments. The pattern of the effects showed some similarities among the three instruments. The *d-scores* for the three measures are also shown in Table 15, and those which are significantly different for differing levels of education are indicated. (The *d-score* is the difference between the group means divided by the standard deviation to standardize the differences between means.) Post-hoc tests determined, for each scale, which levels of education had significantly different mean scores.

The following results were significant for the administration of the WIP-C:

- Those with a two or four years of college were higher on Achievement (Value 1) than those with a high school diploma or less than a high school diploma.
- Those with two or four years of college were lower on Comfort (Value 2) than those with a high school diploma.
- Those with two or four years of college were lower on Safety (Value 5) than those with a high school diploma.
- Scores on Autonomy (Value 6) were greater for those with a two or four year college degree than those who did not graduate high school and those that did.

*Table 15.* Mean Work Value Scores by Educational Attainment

| | | Mean | | | | d-score | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Instrument | Work Value | NHS | HS | SC | C2+ | HS-NHS | SC-NHS | C2+-NHS | SC-HS | C2+-HS | C2+-SC |
| WIP-C | 1. Achievement | 1.47 | 1.53 | 1.61 | 1.78 | 0.09 | 0.19 | 0.46* | 0.12 | 0.39* | 0.24 |
| | 2. Comfort | 0.89 | 0.91 | 0.88 | 0.73 | 0.03 | -0.02 | -0.25 | -0.05 | -0.29* | -0.25 |
| | 3. Status | 1.02 | 0.99 | 1.00 | 0.87 | -0.04 | -0.03 | -0.21 | 0.02 | -0.18 | -0.19 |
| | 4. Altruism | 0.97 | 1.06 | 1.01 | 1.01 | 0.14 | 0.06 | 0.06 | -0.08 | -0.08 | 0.00 |
| | 5. Safety | 1.28 | 1.34 | 1.25 | 1.09 | 0.10 | -0.04 | -0.28 | -0.14 | -0.40* | -0.24 |
| | 6. Autonomy | 0.85 | 0.88 | 1.01 | 1.17 | 0.04 | 0.22 | 0.46* | 0.19 | 0.43* | 0.25 |
| | Sample Size=> | 104 | 456 | 205 | 169 | | | | | | |
| MIQ | 1. Achievement | 1.39 | 1.42 | 1.51 | 1.60 | 0.05 | 0.19 | 0.34 | 0.15 | 0.30* | 0.14* |
| | 2. Comfort | 0.92 | 0.95 | 0.92 | 0.72 | 0.05 | 0.00 | -0.40 | -0.05 | -0.42 | -0.37 |
| | 3. Status | 0.73 | 0.64 | 0.62 | 0.54 | -0.15 | -0.19 | -0.31 | -0.03 | -0.16 | -0.13 |
| | 4. Altruism | 0.72 | 0.66 | 0.69 | 0.73 | -0.10 | -0.05 | 0.02 | 0.05 | 0.11* | 0.06 |
| | 5. Safety | 1.00 | 0.96 | 0.91 | 0.77 | -0.07 | -0.14 | -0.37 | -0.08 | -0.31* | -0.21 |
| | 6. Autonomy | 0.72 | 0.89 | 0.92 | 1.11 | 0.25 | 0.32 | 0.68* | 0.05 | 0.34 | 0.33 |
| | Sample Size=> | 69 | 227 | 144 | 107 | | | | | | |

* $p < .05$ using Tukey's correction for experiment wise error.

NHS = Did not graduate high school
HS = Graduated high school
SC = Attended some college but did not get a degree
C2+ = Obtained a college degree (2- or 4-year)

## Gender and Racial/Ethnic Group

A two-way MANOVA was performed on each instrument (MIQ, WIP-C) to determine if the levels of racial/ethnic group or gender affected the magnitude of the scores. Years of education was used as a covariate to remove the potential confounding influence of education. Only Whites, African Americans, and Hispanics were included in the analyses because of the small number of individuals in the other racial/ethnic groups.

The MANOVA showed statistically significant effects for racial/ethnic group, gender, and education for each of the instruments. The interaction between racial/ethnic group and gender was not statistically significant ($p \geq .05$).

- Safety apparently was more important to females than to males.
- Altruism apparently was more important to females than to males.

- Status apparently was more important to African Americans and Hispanics than to Whites.
- Safety apparently was more important to African Americans than to Whites.

The *d-scores* are shown in Tables 16 and 17.

## Summary

For the WIP-C, level of education was related to differences on the values of Achievement, Autonomy, Safety, and Comfort. Related to racial/ethnic group, African Americans and Hispanics tended to express higher value for Status than did Whites. Females tended to express higher value for Safety and Altruism than males.

*Table 16*. Mean Work Value Scores by Gender

| Instrument | Work Value | Least-Square Mean | | *d*-score Female - Male | *p*-value of difference |
|---|---|---|---|---|---|
| | | Female | Male | | |
| WIP-C | 1. Achievement | 1.60 | 1.58 | 0.03 | |
| | 2. Comfort | 0.87 | 0.91 | -0.06 | |
| | 3. Status | 0.97 | 1.06 | -0.13 | |
| | 4. Altruism | 1.07 | 1.01 | 0.09 | |
| | 5. Safety | 1.30 | 1.20 | 0.15 | .047 |
| | 6. Autonomy | 0.92 | 1.03 | -0.16 | |
| MIQ | 1. Achievement | 1.53 | 1.43 | 0.16 | |
| | 2. Comfort | 0.88 | 0.85 | 0.05 | |
| | 3. Status | 0.60 | 0.66 | -0.10 | |
| | 4. Altruism | 0.79 | 0.63 | 0.25 | .011 |
| | 5. Safety | 1.01 | 0.74 | 0.43 | <.001 |
| | 6. Autonomy | 0.89 | 0.94 | -0.08 | |

*Note*. The least-square means are adjusted for racial/ethnic group and years of education.

*Table 17.* Mean Work Value Scores by Racial/Ethnic Group

| Instrument | Value | LS Mean | | | *d*-score Af. Amer. White | *p*-value of diff. | *d*-score Hisp - White | *p*-value of diff. |
|---|---|---|---|---|---|---|---|---|
| | | Af. Amer. | Hisp | White | | | | |
| WIP-C | 1. Achievement | 1.57 | 1.63 | 1.56 | 0.01 | | 0.10 | |
| | 2. Comfort | 0.91 | 0.92 | 0.83 | 0.13 | | 0.15 | |
| | 3. Status | 1.04 | 1.12 | 0.88 | 0.24 | .001 | 0.36 | .001 |
| | 4. Altruism | 1.04 | 1.06 | 1.02 | 0.03 | | 0.06 | |
| | 5. Safety | 1.33 | 1.19 | 1.23 | 0.16 | .032 | -0.06 | |
| | 6. Autonomy | 0.97 | 1.04 | 0.92 | 0.07 | | 0.17 | |
| MIQ | 1. Achievement | 1.47 | 1.53 | 1.43 | 0.06 | | 0.16 | |
| | 2. Comfort | 0.95 | 0.79 | 0.87 | 0.14 | | -0.15 | |
| | 3. Status | 0.72 | 0.66 | 0.51 | 0.35 | <.001 | 0.25 | |
| | 4. Altruism | 0.64 | 0.79 | 0.70 | -0.09 | | 0.14 | |
| | 5. Safety | 0.98 | 0.76 | 0.88 | 0.16 | | -0.19 | |
| | 6. Autonomy | 0.93 | 0.94 | 0.88 | 0.08 | | 0.09 | |

*Note*. The least-square means are adjusted for gender and years of education.

# Chapter 7. Main Study: Evidence of Reliability of the WIP-C

## Introduction

This chapter describes reliability and the various reliability studies that were performed on the data related to the WIP-C. The reliability estimates include test-retest, internal consistency, and decision consistency reliability.

The term *reliability* refers to the degree to which a measurement procedure is free from unsystematic errors of measurement and the degree to which it gives one the same values if the measurement procedure is repeated. An individual responding to an instrument is likely to have different results if measured more than once on the same measure. Systematic differences in scores (e.g., improvement on a test taken at two different times because the individual's knowledge has increased between tests) should not be considered to contribute to the *unreliability* of an instrument. But an individual's results may change when measured more than once on the same instrument because of unsystematic effects (e.g., mismarking a response to an item, feeling tired one day but not the next). Such unsystematic differences are considered unreliability. Differences could be due to changes in motivation, energy, attention, anxiety, or other such factors. Unreliability limits the ability to generalize from individuals' results on a single instrument. The higher the reliability of a measure, the better it is for drawing conclusions based on values obtained on the measure.

There are several ways to assess the reliability of measurement, depending on the type of consistency with which one is most concerned. *Test-retest reliability* refers to the consistency of results when the same individual is assessed on the same instrument at two points in time. This information is obtained by looking at the degree of relationship (i.e., correlation) between examinees' scores obtained on the instrument at the different points in time. Estimates of test-retest reliability are particularly useful if the characteristic being measured is not expected to change over the time between the two measurement periods (e.g., a measure of personality characteristics of normal adults at two points in time that are a month apart, as opposed to a measure of knowledge administered before and after a course on the subject of the measure). Given that work values of adults are considered to be relatively stable characteristics, it would be expected that individuals' responses to the WIP-C should be stable across time.

Another important way to assess reliability is the evaluation of similar responding by the same individuals on forms that have been created to be *alternative* or *parallel forms* of the same instrument. This estimate of reliability is useful here because the WIP-C and WIL-P&P were designed to be used interchangeably, depending on the computer resources of the location where measurement is taking place. These forms were also designed to closely parallel the original MIQ, although some differences can be expected due to wording changes in some items (see Table 2). Similar results for the same individuals on these different instruments are desirable and would support using the measures interchangeably.

A third type of reliability analysis, *internal consistency reliability*, is used to determine whether different items which are measuring the same subject on the same instrument have highly related

results. For example, if a test included 10 items on addition and 10 items on reading ability, one would expect to see higher interrelationships within the set of 10 addition items and within the set of 10 reading ability items than between items from the two sets. Thus, internal consistency reliability is another type of reliability analysis which can be applied to the WIP-C to assess the adequacy of its development. It is desirable to have high internal consistencies among items within the same scale (i.e., the needs that are used to measure each of the six work values).

## Test-Retest Reliability

Study 1 assessed the test-retest reliability of the WIP-C. In this study, the work values instruments were administered in junior college classes and then re-administered in the same classes 4-8 weeks later. Each participant completed both the WIP-C and the WIL-P&P at each administration. The order of the two instruments was balanced: approximately one-half of the participants completed the WIP-C first ($n$ = 234) while the others completed the WIL-P&P first ($n$ = 269). At the second administration, each participant took the measures in the same order as at the first administration. For the WIP-C, 213 individuals provided complete data at both administrations. Of these, 102 took the WIP-C first and 111 took the WIP-C second during the two administration times.

Test-retest reliability was examined in three ways. First, the correlations between the Time 1 and Time 2 results were computed for each need and value. Second, the proportion of the participants whose top values or needs (i.e., the values or needs that were ranked the highest and thus considered most important to the respondent) were the same (or nearly the same) at Time 1 and Time 2 was also determined. Third, the correlations between the profiles for an instrument at Time 1 versus Time 2 were computed. This was done for both the needs profiles and the work values profiles.

Table 18 shows the test-retest correlations for each need and value. The WIP-C test-retest correlations for the needs ranged from .50 –.76 with a median of .63. These figures are of moderate but acceptable magnitude for these types of instruments. It is possible that many of the participants' needs and values were not clearly formed or articulated, which would attenuate all the psychometric measures. As expected, the correlations for the values are less variable, ranging from .59–.66 with a median of .62. These figures are also of moderate magnitude.

Test-retest reliability was also examined from a *decision consistency* perspective. If respondents will use the measurement results to help select an occupation, then exactly how respondents use their results should be considered. One possibility is that the respondent will consider only the top one or two values in the decision. In this case, the appropriate measure of test-retest reliability is how often people come up with the same top one or two values each time they take the measure. These matching analyses answer the question: "Are the top few needs or work values the same ones each time a person completes the instrument?"

*Table 18.* Test-Retest Correlations

| | | | Measure |
|---|---|---|---|
| Value | Item | Need Name | WIP-C |
| 1. Achievement | 1[1] | Ability Utilization | 55 |
| | 2[1] | Achievement | 64 |
| 2. Comfort | 3 | Activity | 76 |
| | 7 | Compensation | 67 |
| | 10[1] | Independence | 63 |
| | 14 | Security | 64 |
| | 19 | Variety | 63 |
| | 20 | Working Conditions | 58 |
| 3. Status | 4 | Advancement | 50 |
| | 5[2] | Authority | 67 |
| | 12[1] | Recognition | 67 |
| | 16[2] | Social Status | 62 |
| 4. Altruism | 8[2] | Co-Workers | 63 |
| | 11[3] | Moral Values | 69 |
| | 15 | Social Service | 76 |
| 5. Safety | 6[2] | Company Policies | 53 |
| | 17[1] | Supervision: Human Relations | 59 |
| | 18[1] | Supervision: Technical | 60 |
| 6. Autonomy | 9[1] | Creativity | 66 |
| | 13 | Responsibility | 54 |
| | 21 | Autonomy | 57 |
| 1. Achievement | | | 62 |
| 2. Comfort | | | 61 |
| 3. Status | | | 59 |
| 4. Altruism | | | 66 |
| 5. Safety | | | 60 |
| 6. Autonomy | | | 62 |

*Note.* Decimal points omitted. $N = 213$ for WIP-C. WIP-C = computerized profiler.
[1]Minor difference in the wording of the MIQ vs. other versions for this item.
[2]Moderate difference in the wording of the MIQ vs. other versions for this item.
[3]Substantial difference in the wording of the MIQ vs. other versions for this item.

Table 19 shows how consistent the value rankings were between Time 1 and Time 2 for the WIP-C. When the WIP-C was completed first, 62 percent of respondents had the same value ranked first both times, and 52 percent of respondents had the same two values ranked in the top two. When the WIP-C was completed after the WIL-P&P, 70 percent of respondents had the same value ranked first both times, and 49 percent of respondents had the same two values ranked in the top two. These figures may seem lower than one would like. A look at the first two rows in Table 19, however, shows that when the top value at Time 1 was not ranked first at Time 2, it was usually ranked second. Thus, the top value at Time 1 was ranked first or second at Time 2 for an average of 88 percent of the WIP-C respondents (86 percent for those who took the WIP-C first, and 90 percent for those who took the WIP-C second). This supports the use of the top values obtained from the WIP-C for use in career exploration.

*Table 19.* Percentage of the Time the Ordered Values Matched at Time 1 and Time 2: WIP-C

| Type of Match Among Value Ranks | C-P | P-C |
|---|---|---|
| Rank 1 value at Time 1 has Time 2 rank = 1 | 62% | 70% |
| Rank 1 value at Time 1 has Time 2 rank = 2 | 24% | 20% |
| Rank 1 value at Time 1 has Time 2 rank = 3 | 9% | 3% |
| Rank 1 value at Time 1 has Time 2 rank = 4 | 2% | 6% |
| Rank 1 value at Time 1 has Time 2 rank = 5 | 2% | 2% |
| Rank 1 value at Time 1 has Time 2 rank = 6 | 1% | 0% |
| 1st- and 2nd-ranked values match (any order) | 52% | 49% |
| 1st- and 2nd-ranked values match (same order) | 35% | 34% |
| Sample size | 99 | 106 |

*Note.* The subjects in this table took the WIP-C at two separate times (about 6 weeks apart). P-C and C-P represent the order in which the two measures were taken.

Similar analyses were performed at the need level to see if the needs that were in the top five at Time 1 were likely to also be in the top five at Time 2. The results of this analysis indicate that need scores appear to be as stable as work value scores for the purpose of using just the top five needs versus the top work value to help choose an occupation (see Table 20). The histograms and frequency tables in Appendix D show the test-retest matching results for both needs and work values in greater detail.

The third type of test-retest reliability analysis involved calculating the correlations between WIP-C score profiles at Time 1 and Time 2. Correlations were obtained for the needs profiles and the work values profiles. The correlations between the profiles at Time 1 and Time 2 were moderate for the WIL-P&P ($r$ = .64, .62) for both the need ranks and the work value ranks, respectively.

*Table 20.* Percentage of the Time the Need Ranks Matched at Time 1 and Time 2

| Type of Match Among Need Ranks | WIP-C |
|---|---|
| Top need at Time 1: Time 2 rank = 1 | 42% |
| Top need at Time 1: (within top 5 at Time 2) | 82% |
| 2nd need at Time 1: (within top 5 at Time 2) | 80% |
| 3rd need at Time 1: (within top 5 at Time 2) | 65% |
| 4th need at Time 1: (within top 5 at Time 2) | 55% |
| 5th need at Time 1: (within top 5 at Time 2) | 48% |
| Sample size | 205 |

*Note.* The subjects in this table took the WIP-C at two separate times (about 6 weeks apart).

In summary, the WIP-C test-retest correlations for the individual needs were moderate, ranging from .53 to .76 with a median of .63. The correlations for the values were less variable with a range of .59 to .66 and a median of .62. On average, for the WIP-C, the top value was the same one at Times 1 and 2 for about 66 percent of the respondents. This figure averaged about 50 percent for the top two values. Fortunately, the top value at Time 1 is ranked first or second at Time 2 for an average of 88 percent of the WIP-C respondents. The top need (of 21) was selected as either the first or second need, at the time of second testing, 82 percent of the time. Correlations of Time 1 and Time 2 scores were moderately high ($r$ = .77, .72) for the profiles of both the needs and work values, respectively. Although the degree of reliability represented by these results is moderate, none of the results was particularly low. These results provide support for the use of the WIP-C and, in particular, for the use of the top few needs or top one or two work values for the exploration of careers.

## Correlations Between Instruments

As mentioned previously, the two work values instruments were developed to be alternative measures to each other and to the MIQ. Therefore, scores should correlate highly between these instruments. Table 21 shows the correlations between the instruments. For one comparison, the

WIL-P&P scores were adjusted using the mean WIP-C score in an attempt to reduce the effects of ipsative scoring on the WIL-P&P. This correction for ipsatization did increase the correlations between the WIP-C and WIL-P&P.

The WIP-C had moderate to moderately high correlations with the MIQ for both the needs and values. The median correlations were .75 and .76 for the needs and values, respectively. Thus, the WIP-C and MIQ appeared to be measuring the same constructs (please see next chapter). The needs that had significant differences in wording between the WIP-C and MIQ generally had lower correlations. Consequently, the work values scales that included these items tended to have low correlations between instruments. The scale most affected by wording changes (i.e., Altruism) had the lowest correlation.

An additional set of analyses was performed to assess the decision consistency between instruments. These analyses are most appropriate when only the top values are used to help select an occupation. The analyses focused on the top two values for each person. Table 22 shows that the top value was usually the same for each pair of instruments, but the correspondence between instruments dropped sharply for the top *two* values. The top WIP-C and MIQ values matched for two-thirds of the respondents, and the top two values matched for half of the respondents.

The final set of analyses examined the similarity among the respondents' MIQ, WIP-C, and WIL-P&P profiles. For each respondent, profile correlations were computed for both the need and value profiles. That is, for each respondent, the instruments were considered to be variables and the needs were considered to be cases. The correlations between the instruments were computed for the respondent. Table 23 shows the median correlations between the profiles for each instrument pair. The profile correlations were .05–.10 higher for the needs than for the work values. In summary, the WIP-C showed respectable correspondence with the MIQ, and somewhat less correspondence with the WIL-P&P.

*Table 21.* Correlations Between the Instruments

| | | | Measures | | | |
|---|---|---|---|---|---|---|
| Value | Item | Need Name | C–P | C-$P_{adjusted}$ | C–M | P–M |
| 1. Achievement | 1[1] | Ability Utilization | 42 | 62 | 74 | 35 |
| | 2[1] | Achievement | 40 | 61 | 66 | 27 |
| 2. Comfort | 3 | Activity | 54 | 71 | 80 | 50 |
| | 7 | Compensation | 57 | 73 | 84 | 63 |
| | 10[1] | Independence | 48 | 69 | 84 | 57 |
| | 14 | Security | 51 | 69 | 75 | 51 |
| | 19 | Variety | 46 | 69 | 76 | 46 |
| | 20 | Working Conditions | 39 | 65 | 71 | 37 |
| 3. Status | 4 | Advancement | 42 | 65 | 76 | 44 |
| | 5[2] | Authority | 48 | 70 | 67 | 39 |
| | 12[1] | Recognition | 51 | 71 | 80 | 42 |
| | 16[2] | Social Status | | | 59 | |
| 4. Altruism | 8[2] | Co-Workers | 44 | 65 | 73 | 54 |
| | 11[3] | Moral Values | 58 | 71 | 56 | 48 |
| | 15 | Social Service | 57 | 73 | 78 | 53 |
| 5. Safety | 6[2] | Company Policies | 35 | 61 | 55 | 38 |
| | 17[1] | Supervision: Human Relations | 43 | 64 | 67 | 41 |
| | 18[1] | Supervision: Technical | 46 | 67 | 65 | 45 |
| 6. Autonomy | 9[1] | Creativity | 45 | 68 | 82 | 47 |
| | 13 | Responsibility | 40 | 67 | 80 | 35 |
| | 21 | Autonomy | 37 | 64 | 78 | 44 |
| 1. Achievement | | | 47 | 73 | 75 | 34 |
| 2. Comfort | | | 32 | 85 | 80 | 43 |
| 3. Status | | | 38 | 76 | 77 | 30 |
| 4. Altruism | | | 42 | 77 | 67 | 47 |
| 5. Safety | | | 43 | 77 | 70 | 49 |
| 6. Autonomy | | | 45 | 81 | 84 | 49 |

*Note.* Decimal points omitted. $N = 670$ for C-P, $N = 221$ for C-M, and $N = 668$ for C-P and C-$P_{adjusted}$ C = computerized profiler, M = MIQ, P = paper and pencil, $P_{adjusted}$ = paper and pencil profiler with scores adjusted using importance ratings from computerized profiler.
[1]Minor difference in the wording of the MIQ vs. other versions for this item.
[2]Moderate difference in the wording of the MIQ vs. other versions for this item.
[3]Substantial difference in the wording of the MIQ vs. other versions for this item.

*Table 22.* Percentage of Matches for Top Values Across Work Values Measures by Order of Administration

| Measures | Top value matches | Top two values match exact order | Top two values match any order |
|---|---|---|---|
| MIQ / C (*n* = 221) | 66.1 | 48.9 | 34.8 |
| MIQ – C (*n* = 113) | 68.1 | 51.3 | 38.1 |
| C – MIQ (*n* = 108) | 63.9 | 46.3 | 31.5 |
| C / PP (*n* = 668) | 58.7 | 39.8 | 27.8 |
| C – PP (*n* = 333) | 56.8 | 39.6 | 26.1 |
| PP – C (*n* = 335) | 60.6 | 40.0 | 29.6 |

*Note*. C = WIP-C, PP = WIL-P&P.

*Table 23.* Median Profile Correlations Between the Instruments

| | Need Profiles | | Work Value Profiles |
|---|---|---|---|
| Instrument | WIP-C | WIL-P&P | WIP-C |
| WIL-P&P | 71 | | 66 |
| MIQ | 77 | 67 | 71 |

*Note*. Decimals omitted.

## Internal Consistency Reliability

The internal consistency reliabilities of the six work values scales were estimated using coefficient alpha, an index of how well the items in a scale measure the same construct. High values arise when items are highly correlated and thus indicate that the items are measuring the same construct; low values indicate either that the items are not measuring any clear construct, or that they are measuring two or more constructs that are not highly related.

The coefficient alpha statistics are shown in Table 24. The moderate to high reliabilities for the WIP-C (median alpha = .76) and the MIQ (median alpha = .73) are generally somewhat lower than the ideal level of internal consistency for scales used to help individuals make decisions, but they are acceptable. The alpha values of .50 and .48 for the Altruism scale, however, are lower than desirable.

In summary, the internal consistency figures for the WIP-C scales are generally adequate, and, importantly, they parallel the MIQ internal consistency reliabilities.

Table 24. *Internal Consistency Reliability Estimates (Coefficient Alpha)*

| | | Tests | | |
|---|---|---|---|---|
| | Number | WIP-C | | MIQ |
| Value | of Items | Test | Retest | |
| 1. Achievement | 2 | 75 | 71 | 75 |
| 2. Comfort | 6 | 76 | 71 | 71 |
| 3. Status | 4 | 76 | 73 | 69 |
| 4. Altruism | 3 | 50 | 46 | 48 |
| 5. Safety | 3 | 79 | 79 | 82 |
| 6. Autonomy | 3 | 86 | 84 | 84 |
| *N* | | 941 | 213 | 550 |

*Note.* Decimal points omitted. Test = instrument taken at Time 1, Retest = instrument taken at Time 2.

## Summary of the Reliability Results

Results of test-retest reliabilities for the WIP-C were moderately high and provide support for relatively similar responding to the WIP-C by the respondents at two administrations 4-8 weeks apart. The results of the reliability analyses for the WIP-C and the MIQ show that they produce similar results at both the need and value (i.e., scale) levels. In fact, the WIP-C correlated more highly with the MIQ (with no delay between the two administrations) than it did with itself (with a 4-8 week delay between administrations). This is strong evidence that the WIP-C is a suitable substitute for the MIQ. Moderate to high correlations between the scales of the two instruments, except for the Altruism scale, support the idea that the two instruments are measuring the same things. Internal consistency reliabilities, as measured by coefficient alpha, were moderately high for the WIP-C and support the idea that the individual items within each value scale are generally measuring a similar idea or construct.

The top value selected on the WIP-C was the same from the first to the second testing about 66 percent of the time. The top value for Time 1 was the same as the first or second value for Time 2 about 88 percent of the time. At the needs level, the top need at Time 1 testing was the same as Time 2 about 42 percent of the time. However, the top value at Time 1 was within the top five needs about 82 percent of the time. This shows that the top values or the top few needs are reasonable to use in determining one's values and needs and using that information in career exploration.

The wording changes did appear to alter the meaning of some of the items, as evidenced by the lower correlations between the WIP-C and MIQ for items with significant changes in wording. The item with the greatest wording change (Moral Values) had the lowest correlation between the two instruments.

# Chapter 8. Main Study: Preliminary Evidence of Validity for the WIP-C

## Introduction

The WIP-C was designed to measure the same constructs as the original MIQ. The WIP-C closely paralleled the MIQ, but wording changes on items between the MIQ and WIP-C limit their treatment as parallel or alternative forms (see Table 2). Preliminary validity analyses for the WIP-C focused on the construct validity of the profiler to determine the degree to which: a) the WIP-C and the MIQ appeared to be measuring the same constructs; and b) whether the constructs were those identified by the Theory of Work Adjustment (Dawis, Lofquist, & Weiss, 1968). Specifically, exploratory and confirmatory factor analyses were conducted to see if the factor structure of the needs (i.e., items) in the instruments reflected the six hypothesized work values (i.e., scales) from the MIQ.

Portions of the reliability analyses reported in Chapter 7 partially address the construct validity questions. First, the correlations between the instruments show that the need and value scores for the MIQ are strongly related to the corresponding scores on the WIP-C. This is evidence that the WIP-C and MIQ are measuring similar constructs. Because high reliability is a necessary condition for high validity, low to moderate internal consistency and test-retest reliabilities of the six work values scales would limit the validities of scales on the WIP-C. Therefore, for those WIP-C values scales that have low or moderate reliabilities (e.g., Altruism), one can expect more moderate validities.

The following sections discuss the results of the exploratory and confirmatory factor analytic procedures and the evidence they present regarding construct validity.

## Exploratory Factor Analyses

The factor structures of the MIQ and the WIP-C were investigated using exploratory factor analysis (SAS System for Windows release version 6.11). Selected results are shown in tables in this chapter. Common factor analysis (rather than principal components analysis) was performed because the latter method assumes that the constructs of interest are perfectly measured by the instruments. The reduced correlation matrices (with mean squared correlations in the diagonals) of the MIQ and WIP-C were factored using the iterated principal axis method. The communalities were unconstrained during the iteration process, but all remained less than one throughout the iterations. Because the work values could theoretically be correlated, oblique rotations were performed. The Harris-Kaiser rotation method was used, and the degree of obliqueness was not constrained (i.e., the power was set to 0).

The Main Study data (i.e., omitting the retest data) were factor analyzed. The number of factors to extract was determined by the following criteria:

- the number of eigenvalues greater than one in the correlation matrix,
- the number of eigenvalues greater than zero in the reduced correlation matrix,
- the location of scree in the scree plot,
- discontinuities in the scree plot,
- a parallel analysis of the eigenvalues (comparison with the scree plots of random data), and
- interpretability of the factors.

According to these criteria, a seven-factor solution seemed best for both the WIP-C and MIQ data. The criteria were not completely consistent. Therefore, several runs were conducted to extract different numbers of factors in each run. The main criterion for judging the factor analysis solutions was "cleanness" (i.e., the degree of simple structure) of the solution. In a very clean solution, each item would have a high factor loading (i.e., > .7) on only one factor and low loadings (< .3) on the other factors. In addition, all the items in the same scale—and only these items—should load highly on the same factor.

Throughout the analyses, work value scales 1 and 6 (Achievement, Autonomy) consistently appeared as clean factors. The appropriate items from the instruments loaded highly on these two factors. Scale 5 (Safety) was moderately clean in most of the analyses. There was no factor for scale 4 (Altruism) in any of the analyses, and the three items in this scale had the lowest communalities in most of the analyses. Scales 2 and 3 (Comfort, Status) yielded mixed results: they were not completely clean in any of the analyses, but many of the items loaded cleanly on the appropriate factor. In some of the analyses, the six items in the Comfort scale split into two factors that were labeled Intrinsic Comfort (Independence, Creativity, Activity) and Extrinsic Comfort (Compensation, Security, Working Conditions).

The seven-factor solutions are shown in Table 25. This table shows the factor pattern matrices (i.e., the loadings on the correlated factors, which are interpreted as standardized regression coefficients where the item is regressed on the factors) for both the MIQ and WIP-C. As mentioned, the Comfort scale split into two factors (Intrinsic Comfort and Extrinsic Comfort). Scales 1 and 6 (Achievement, Autonomy) each formed a clean factor. Scale 5 (Safety) fit well for the MIQ; for the WIP-C, two of the three Safety needs (i.e., the two needs concerning supervision) loaded on the same factor. Scales 2, 3, and 4 (Comfort, Status, Altruism) were not as clean. They exhibited some cases of low loadings or loadings on unintended factors. The MIQ tended to have a cleaner factor structure than the WIP-C, especially on the Comfort scales.

The effects of the wording changes to the original MIQ items are clear in Table 25. Note that just one of the seven items that experienced minor wording changes had a large "off-factor" loading (Item 10, Independence, loading .63 on Autonomy for the WIL-P&P). Yet three of the five items that experienced moderate to substantial wording changes had large off-factor loadings (Items 8, Co-workers; 11, Moral Values; and 6, Company Policies).

*Table 25.* Factor Loadings for Seven-Factor MIQ and WIP-C Exploratory Factor Analyses

| | | | Achievement | | Intrinsic Comfort | | Extrinsic Comfort | | Status | | Altruism | | Safety | | Autonomy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Value | | Need | MIQ | WVP | MIQ | WVP | MIQ | WVP | MIQ | WVP | MIQ | WVP | MIQ | WVP | MIQ | WVP |
| 1. Achievement | 1 [1] | Ability Utilization | 85 | 70 | | | | | | | | | | | | |
| | 2 [1] | Achievement | 72 | 77 | | | | | | | | | | | | |
| 2. Comfort | 3 | Activity | | | 85 | 84 | | | | | | | | | *54* | |
| | 10 [1] | Independence | | *-30* | 35 | 35 | | | | | | | | | *30* | *63* |
| | 19 | Variety | | | 46 | 63 | | | | | | | | | | |
| | 7 | Compensation | | | | | 65 | 44 | | | | *37* | | | | *31* |
| | 14 | Security | | | | | 81 | 38 | | | | *52* | | | | |
| | 20 | Working Conditions | | | | | 43 | 71 | | | *35* | | | | | |
| 3. Status | 4 | Advancement | *34* | | | | *51* | | 10 | 4 | *-34* | *73* | | | | |
| | 5 [2] | Authority | | | | | | | 27 | 25 | | | | | *55* | *50* |
| | 12 [1] | Recognition | | | | | | | 43 | 44 | | | | | | |
| | 16 [2] | Social Status | | | | | | | 85 | 91 | | | | | | |
| 4. Altruism | 8 [2] | Co-Workers | | | | | *74* | | *32* | | 45 | -19 | | | | |
| | 11 [3] | Moral Values | | | | | *50* | | | | 51 | -17 | | | | |
| | 15 | Social Service | | *49* | | | | | | | 39 | -35 | | | | |
| 5. Safety | 6 [2] | Company Policies | | | | | *73* | | | | | | 66 | 9 | | |
| | 17 [1] | Supervision: Human Relations | | | | | | | | | | | 90 | 81 | | |
| | 18 [1] | Supervision: Technical | | | | | | | | | | | 69 | 76 | | |
| 6. Autonomy | 9 [1] | Creativity | | | | | | | | | | | | | 64 | 76 |
| | 13 | Responsibility | | | | | | | | | | | | | 102 | 99 |
| | 21 | Autonomy | | | | | | | | | | | | | 75 | 76 |

[1]Minor difference in the wording of the MIQ vs. WIP-C versions for this item.
[2]Moderate difference in the wording of the MIQ vs. WIP-C versions for this item.
[3]Substantial difference in the wording of the MIQ vs. WIP-C versions for this item.
*Note*. $N = 550$ for the MIQ, $N = 941$ for the WIP-C. Loadings on the wrong factors are italicized. Loadings on the correct factors are inside rectangles.
*Note.* WVP = WIP-C.

## Confirmatory Factor Analyses

Confirmatory factor analyses (using LISREL v. 8.14a) were performed for the MIQ and WIP-C for the *a priori* six-factor and empirical seven-factor models. The *a priori* six factor models (one using MIQ data and one using WIP-C data from this project) were based on the theoretical conceptualization of the factor structure of the MIQ. Each item was constrained to load only on its one relevant factor. Items that form the same scale were forced to load on the same factor. Orthogonal (factors not allowed to correlate with one another) and oblique (factors allowed to correlate with one another) solutions were compared. Given the six-factor structure of the MIQ, one would hypothesize that the best fitting model would be a six-factor model with each item loading only on its one relevant factor and with the oblique solution allowing factors to be correlated with one another.

Additional confirmatory factor analytic models were run using the seven-factor oblique models from the exploratory factor analyses. The results from the exploratory analyses were used to specify these models. Thus, these models were derived empirically from the same data used in the confirmatory factor analyses. For the MIQ, each item was forced to load on only the one factor on which it had loaded most highly in the exploratory analysis. Intercorrelations among all factors were freely estimated. Two models were set up for the WIP-C: a) the WIP-C Empirical Oblique 7-Factor, in which items loaded on the one factor on which they had loaded in the exploratory results based on WIP-C data; and b) the MIQ Empirical Oblique 7-Factor, in which items loaded on the one factor on which they had loaded in the exploratory results based on the MIQ data. Thus, the MIQ Empirical Oblique 7-Factor model used the loading pattern from the MIQ results with the WIP-C data.

Table 26 shows fit statistics for the models. Several fit statistics are shown, because no single statistic has been determined to be exclusively accepted for assessing models. The $\chi^2$ may be viewed as a test statistic for the hypothesis that discrepancies between the model and data are due only to sampling variation rather than due to model misspecifications or departures from underlying assumptions. For models based on the same items and sample, smaller $\chi^2$s generally indicate better fit, but this is influenced by the number of parameters estimated and number of degrees of freedom remaining in a model. The degrees of freedom are based on the number of elements in the covariance matrix used as data input for the model and are reduced by the number of parameters estimated in the model. The RMR (see the note to Table 26 for the full names of all of the fit indices) represents the average of the residual differences of the fitted covariance matrix (which is based on the model's parameter estimates) from the observed covariance matrix (which is based on the raw data). The RMSEA measures the residuals or discrepancies per degree of freedom. For both of these indices, the smaller the number, the better the fit is considered to be. RMSEA values less than .08 and RMR values less than .05 are considered desirable. Other fit indices (e.g., NNFI, CFI) use the degrees of freedom to adjust the $\chi^2$ statistic in various formulas to assess the fit of a model and to compare the model's $\chi^2$ to the $\chi^2$ for a "null" model which specifies no relationships between items. Values of .90 are generally considered desirable for these types of fit indices, although this is an arbitrary cutoff point (Jöreskog & Sörbom, 1993; Medsker, Williams, & Holahan, 1994).

*Table 26.* Fit Statistics for the Various Confirmatory Factor Analysis Models Applied to the MIQ and WIP-C

| | MIQ (*n*=550) | | | WIP-C (*n*=941) | | | |
|---|---|---|---|---|---|---|---|
| Fit Statistic | Orthogonal 6-Factor | Oblique 6-Factor | MIQ Empirical Oblique 7-Factor | Orthogonal 6-Factor | Oblique 6-Factor | WIP-C Empirical Oblique 7-Factor | MIQ Empirical Oblique 7-Factor |
| $\chi^2$ | 2,199 | 1,118 | 776 | 4,519 | 2,001 | 1,192 | 1,481 |
| df | 190 | 174 | 168 | 190 | 174 | 168 | 168 |
| RMSEA | .14 | .10 | .08 | .16 | .11 | .08 | .09 |
| RMR | .25 | .08 | .07 | .30 | .08 | .06 | .07 |
| GFI | .68 | .82 | .88 | .63 | .81 | .88 | .87 |
| AGFI | .61 | .76 | .84 | .55 | .74 | .84 | .81 |
| NFI | .53 | .76 | .83 | .52 | .79 | .87 | .84 |
| NNFI | .51 | .75 | .83 | .48 | .76 | .86 | .82 |
| CFI | .55 | .79 | .86 | .53 | .80 | .89 | .86 |

*Note*. df=degrees of freedom, RMSEA = Root Mean Square Error of Approximation, RMR = Root Mean Square Residual, GFI = Goodness of Fit Index, AGFI = Adjusted Goodness of Fit Index, NFI = Normed Fit Index, NNFI = Non-Normed Fit Index, CFI = Comparative Fit Index (Jöreskog & Sörbom, 1993). All chi-square values are statistically significant at $p < .001$. MIQ Empirical 7-Factor = MIQ Empirical 7-Factor model structure was applied to the WIP-C data.

For the six-factor models, the oblique model fit much better than the orthogonal model, as expected. Nevertheless, the goodness of fit indices for the six-factor oblique solutions are marginal. The seven-factor models fit much better than the six-factor models for both instruments: the reduction in $\chi^2$ value (1,118 - 776 = 342; 2,001 - 1,192 = 809), relative to the change in the number of degrees of freedom from the oblique 6-factor to the empirical 7-factor model (174 - 168 = 6 for both instruments), was significant ($p < .01$). RMSEAs were .08 and RMRs were .06 and .07, which are nearer the values generally associated with acceptable fit (i.e., less than .08 for the RMSEAs and less than .05 for the RMRs). Other fit indices (i.e., GFI, AGFI, NFI, NNFI, and CFI) were nearer the .90 value which is often arbitrarily used as a cutoff for acceptable fit for structural models. None of the models had any obvious misspecifications of the loadings. Rather, model misfit seemed to stem from the factor model not describing the item intercorrelations very well.

The fit of the MIQ versus the WIP-C was compared for each model. The Oblique 6-Factor model did not clearly fit the MIQ better than it fit the WIP-C. Loadings for the Oblique 6 Factor

model, as shown in Table 27, were similar for the MIQ and WIP-C data. Most importantly, the WIP-C data fit the Empirical Oblique 7-Factor model somewhat better than the MIQ data according to some of the fit indices. Factor loadings were again similar for the MIQ and WIP-C data, as shown in Table 27. The factor intercorrelations tended to be lower for the MIQ than for the WIP-C, which indicates somewhat more discrimination among factors on the MIQ than on the WIP-C (see Tables 29 through 32).

## Summary

Two important conclusions can be made from the construct validity analyses. First, the MIQ and WIP-C appear to have very similar factor structures. The evidence is particularly strong considering that the WIP-C and MIQ analyses had fewer than half of the subjects in common and several differences in item wordings. The differences that were found in the factor structures may be due to sampling error, differences in the individual subjects in the samples, or the changes in wording. Second, the data provide moderate support for the present theoretical six-factor work values model. The wording changes appear to hinder the recovery of the six-factor structure and to increase the factor intercorrelations and instability of the resulting structures (see Tables 29 and 30). Although splitting the Comfort value into Internal Comfort and External Comfort improved the fit somewhat, the improved fit occurred at the expense of two needs loading on the "wrong" factors, according to the initial theoretical development of the MIQ (see Table 27, Items 4 and 5). However, data from the MIQ also fit the seven-factor model better than the theoretically developed six-factor model on which the MIQ was based. Thus, results from both measures supported a seven-factor structure.

*Table 27.* MIQ and WIP-C Factor Loadings for the A Priori Six-Factor Model

| | | | Achievement | | Comfort | | Status | | Altruism | | Safety | | Autonomy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Value | | Need | MIQ | WVP | MIQ | WVP | MIQ | WVP | MIQ | WVP | MIQ | WVP | MIQ | WVP |
| 1. Achievement | 1 [1] | Ability Utilization | 77 | 80 | | | | | | | | | | |
| | 2 [1] | Achievement | 78 | 76 | | | | | | | | | | |
| 2. Comfort | 3 | Activity | | | 52 | 58 | | | | | | | | |
| | 10 [1] | Independence | | | 58 | 60 | | | | | | | | |
| | 19 | Variety | | | 65 | 62 | | | | | | | | |
| | 7 | Compensation | | | 47 | 49 | | | | | | | | |
| | 14 | Security | | | 50 | 59 | | | | | | | | |
| | 20 | Working Conditions | | | 55 | 71 | | | | | | | | |
| 3. Status | 4 | Advancement | | | | | 56 | 63 | | | | | | |
| | 5 [2] | Authority | | | | | 67 | 69 | | | | | | |
| | 12 [1] | Recognition | | | | | 65 | 70 | | | | | | |
| | 16 [2] | Social Status | | | | | 52 | 63 | | | | | | |
| 4. Altruism | 8 [2] | Co-Workers | | | | | | | 60 | 60 | | | | |
| | 11 [3] | Moral Values | | | | | | | 39 | 43 | | | | |
| | 15 | Social Service | | | | | | | 52 | 49 | | | | |
| 5. Safety | 6 [2] | Company Policies | | | | | | | | | 78 | 76 | | |
| | 17 [1] | Supervision: Human Relations | | | | | | | | | 80 | 72 | | |
| | 18 [1] | Supervision: Technical | | | | | | | | | 75 | 74 | | |
| 6. Autonomy | 9 [1] | Creativity | | | | | | | | | | | 76 | 81 |
| | 13 | Responsibility | | | | | | | | | | | 91 | 93 |

[1]Minor difference in the wording of the MIQ vs. WIP-C versions for this item.
[2]Moderate difference in the wording of the MIQ vs. WIP-C versions for this item.
[3]Substantial difference in the wording of the MIQ vs. WIP-C versions for this item.
*Note*. $N = 550$ for the MIQ, $N = 941$ for the WIP-C. Loadings on the wrong factors are italicized.
*Note.* WVP=WIP-C.

*Table 28.* Factor Loadings for the Empirical Seven-Factor Oblique MIQ Model: MIQ and WIP-C Data

| | | | Achievement | | Intrinsic Comfort | | Extrinsic Comfort | | Status | | Altruism | | Safety | | Autonomy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Value | | Need | MIQ | WVP | MIQ | WVP | MIQ | WVP | MIQ | WVP | MIQ | WVP | MIQ | WVP | MIQ | WVP |
| 1. Achievement | 1 [1] | Ability Utilization | 77 | 80 | | | | | | | | | | | | |
| | 2 [1] | Achievement | 78 | 75 | | | | | | | | | | | | |
| 2. Comfort | 3 | Activity | | | 58 | 68 | | | | | | | | | | |
| | 10 [1] | Independence | | | 64 | 69 | | | | | | | | | | |
| | 19 | Variety | | | 79 | 79 | | | | | | | | | | |
| | 7 | Compensation | | | | | 57 | 55 | | | | | | | | |
| | 14 | Security | | | | | 72 | 69 | | | | | | | | |
| | 20 | Working Conditions | | | | | 60 | 76 | | | | | | | | |
| 3. Status | 4 | Advancement | | | | | *65* | *63* | | | | | | | | |
| | 5 [2] | Authority | | | | | | | | | | | | | *64* | *67* |
| | 12 [1] | Recognition | | | | | | | 80 | 80 | | | | | | |
| | 16 [2] | Social Status | | | | | | | 56 | 70 | | | | | | |
| 4. Altruism | 8 [2] | Co-Workers | | | | | | | | | 58 | 60 | | | | |
| | 11 [3] | Moral Values | | | | | | | | | 37 | 43 | | | | |
| | 15 | Social Service | | | | | | | | | 55 | 49 | | | | |
| 5. Safety | 6 [2] | Company Policies | | | | | | | | | | | 80 | 80 | | |
| | 17 [1] | Supervision: Human Relations | | | | | | | | | | | 80 | 70 | | |
| | 18 [1] | Supervision: Technical | | | | | | | | | | | 73 | 70 | | |
| 6. Autonomy | 9 [1] | Creativity | | | | | | | | | | | | | 76 | 80 |
| | 13 | Responsibility | | | | | | | | | | | | | 90 | 90 |
| | 21 | Autonomy | | | | | | | | | | | | | 76 | 76 |

[1]Minor difference in the wording of the MIQ vs. WIP-C versions for this item.
[2]Moderate difference in the wording of the MIQ vs. WIP-C versions for this item.
[3]Substantial difference in the wording of the MIQ vs. WIP-C versions for this item.
*Note*. $N = 550$ for the MIQ, $N = 941$ for the WIP-C. Loadings on the wrong factors are italicized.
*Note.* WVP=WIP-C.

*Table 29.* Factor Intercorrelations for the *A Priori* Six-Factor Oblique Model: MIQ Data

| Value | Achievement | Altruism | Autonomy | Comfort | Safety |
|---|---|---|---|---|---|
| Achievement | | | | | |
| Altruism | 67 | | | | |
| Autonomy | 68 | 49 | | | |
| Comfort | 63 | 80 | 65 | | |
| Safety | 32 | 64 | 22 | 63 | |
| Status | 69 | 57 | 72 | 81 | 42 |

*Note. N* = 550. Decimals omitted.

*Table 30.* Factor Intercorrelations for the *A Priori* Six-Factor Oblique Model: WIP-C Data

| Value | Achievement | Altruism | Autonomy | Comfort | Safety |
|---|---|---|---|---|---|
| Achievement | | | | | |
| Altruism | 71 | | | | |
| Autonomy | 74 | 55 | | | |
| Comfort | 61 | 91 | 67 | | |
| Safety | 42 | 86 | 39 | 86 | |
| Status | 72 | 74 | 70 | 82 | 69 |

*Note. N* = 941. Decimals omitted.

*Table 31.* Factor Intercorrelations for the Seven-Factor Empirical Oblique MIQ Model: MIQ Data

| Value | Achieve-ment | Altruism | Autonomy | Intrinsic Comfort | Extrinsic Comfort | Safety |
|---|---|---|---|---|---|---|
| Achievement | | | | | | |
| Altruism | 68 | | | | | |
| Autonomy | 68 | 50 | | | | |
| Intrinsic Comfort | 62 | 70 | 72 | | | |
| Extrinsic Comfort | 47 | 52 | 38 | 48 | | |
| Safety | 32 | 62 | 24 | 35 | 72 | |
| Status | 61 | 47 | 56 | 59 | 54 | 23 |

*Note. N* = 550. Decimals omitted.

*Table 32.* Factor Intercorrelations for the Seven-Factor Empirical Oblique MIQ Model: WIP-C Data

| Value | Achieve-ment | Altruism | Autonomy | Intrinsic Comfort | Extrinsic Comfort | Safety |
|---|---|---|---|---|---|---|
| Achievement | | | | | | |
| Altruism | 71 | | | | | |
| Autonomy | 75 | 59 | | | | |
| Intrinsic Comfort | 64 | 75 | 75 | | | |
| Extrinsic Comfort | 48 | 80 | 49 | 60 | | |
| Safety | 42 | 87 | 44 | 56 | 93 | |
| Status | 63 | 67 | 59 | 57 | 66 | 59 |

*Note. N* = 941. Decimals omitted.

# Chapter 9. Summary and Conclusions

## Summary

This report has detailed the development of the computerized version of the work importance profiler (WIP-C; McCloy, et al 1999B). Two other reports describe the development of the paper-and-pencil work importance locator (WIL-P&P; McCloy et al, 1999C) and the occupational reinforcer patterns (ORPs; McCloy, et al 1999B) that were also components of the work values project sponsored by USDOL.

The WIP-C is a self-administered measure of work values that is modeled on the Minnesota Importance Questionnaire (MIQ; Rounds et al., 1981). When completing the WIP-C, respondents are presented with 21 screens. Each screen contains five need statements with the stem, "On my ideal job it is important that...". The respondent ranks the five statements in order of importance and then proceeds to the next screen. After completing the 21 screens, the respondent rates each need statement as either *important* or *not important*. The computer provides immediate feedback to the client regarding his or her most important work values and work needs.

The development of the WIP-C involved three studies. In the first study, the Pre-Pilot Study, 10 HumRRO and O*NET employees completed the draft version of the WIP-C. Results were used to improve the profiler. In the second study, the Pilot Study, 43 employment center participants took the improved WIP-C. Administrators observed these participants, and participants completed reaction forms. This information was also used to improve the WIP-C. In the third study, the Main Study, the WIP-C, WIL-P&P, and MIQ were administered to employment center clients and junior college students. Respondents took two of the three instruments so that information on the same respondents taking different measures would be available. Some respondents also took the same instruments at two points in time so that test-retest reliabilities could be computed. Results included the following: a) the WIP-C took about 12 minutes longer to complete than the WIL-P&P and about 6 minutes longer than the MIQ; b) few subgroup differences were found for racial/ethnic and gender groups, although several differences by educational level were apparent; c) reliability analyses were encouraging, with moderate to high values for virtually all test-retest and coefficient alpha estimates; and d) the WIP-C and MIQ evidenced similar factor structures and thus appear to be measuring similar constructs, although an empirically determined seven-factor structure provided better fit to the data from both measures than the *a priori* six-factor structure from the Theory of Work Adjustment.

## Conclusions

The WIP-C provides clients who are interested in career exploration with a psychometrically sound, preliminarily construct-valid, rapidly scored measure for identifying their most important work values. The comparisons between this measure and its base measure, the MIQ, show that the two measures provide similar information about clients' work values. The WIP-C has great utility in providing many clients (especially those just entering the job market) with an

opportunity to consider a facet of job satisfaction that they might not have considered previously. Further, experienced clients will benefit from the WIP-C because the complaints of experienced employees about their previous jobs are frequently couched in terms of work values that were not sufficiently reinforced (e.g., insufficient pay, lack of promotion opportunities, lack of support from upper management). As such, the WIP-C can be expected to have high levels of face validity for its users.

The Work Importance Profiler underwent further modifications prior to its final release. These modifications provide greater visual appeal for the computer screens, improvements in the reports generated for users, and other such enhancements to the program. For a complete description of the final WIP, please refer to the O*NET Work Importance Profiler User's Guide, available on the web at: http://www.onetcenter.org/tools.html.

# References

Borgen, F.H., Weiss, D.J., Tinsley, H.E.A., Dawis, R.V., & Lofquist, L.H. (1968). The measurement of occupational reinforcer patterns. *Minnesota Studies in Vocational Rehabilitation, 25*.

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

Dawis, R.V., Lofquist, L.H., & Weiss, D.J. (1968). A theory of work adjustment (a revision). *Minnesota Studies in Vocational Rehabilitation*, *23*.

Gay, E.G., Weiss, D.J., Hendel, D.D., Dawis, R.V., & Lofquist, L.H. (1971). Manual for the Minnesota Importance Questionnaire. *Minnesota Studies in Vocational Rehabilitation*, *28*.

Ghiselli, E.E., Campbell, J.P., & Zedeck, S. (1981). *Measurement theory for the behavioral sciences*. San Francisco: W.H. Freeman & Co.

Holland, J. L. (1997). *Marking vocational choices: A theory of vocational personalities and work environments* (3rd ed.). Englewood Cliff, NJ: Prentice-Hall.

Human Resources Research Organization. (1996). *Work values administration manual*. Alexandria, VA: HumRRO.

Jöreskog, K.G., & Sörbom, D. (1993). *LISREL 8: Structural equation modeling with the SIMPLIS command language*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Lofquist, L.H., & Dawis, R.V. (1969). *Adjustment to work*. New York: Appleton-Century-Crofts.

McCloy, R., Waugh, G., Medsker, G., Wall, J., Rivkin, D., and Lewis P. (1999B). Determining the Occupational Reinforcer Patterns for O*NET Occupational Units. Raleigh, NC: National Center for O*NET Development.

McCloy, R., Waugh, G., Medsker, G., Wall, J., Rivkin, D., and Lewis, P. (1999C). Development of the O*NET Paper-and-Pencil Work Importance Locator. Raleigh, NC: National Center for O*NET Development.

Medsker, G.J., Williams, L.J., & Holahan, P.J. (1994). A review of current practices for evaluating causal models in organizational behavior and human resources management research. *Journal of Management*, *20*, 439-464.

Rounds, J.B., Henly, G.A., Dawis, R.V., Lofquist, L.H., & Weiss, D.J. (1981). *Manual for the Minnesota Importance Questionnaire: A measure of needs and values*. Minneapolis: University of Minnesota Department of Psychology.

Rounds, J.B., Miller, T.W., & Dawis, R.V. (1978). Comparability of multiple rank order and paired comparison methods. *Applied Psychological Measurement*, *2*, 415-422.

Schaffer, R.H. (1953). Job satisfaction as related to need satisfaction at work. *Psychological Monographs*, *67*(364).

Shrout, P.E., & Fleiss, J.L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin*, *86*(2), 420-428.

Stewart, E.S., Greenstein, S.M., Holt, N.C., Henly, G.A., Engdahl, B.E., Dawis, R.V., Lofquist, L.H., & Weiss, D.J. (1986). *Occupational reinforcer patterns*. Minneapolis: Vocational Psychology Research, University of Minnesota Department of Psychology.

U.S. Department of Labor. (1965). *Dictionary of occupational titles* (3rd ed.). Washington, DC: U.S. Government Printing Office.

U.S. Department of Labor. (1998). *O*NET 98: Viewer user's guide.* Washington, DC: U.S. Government Printing Office.

U.S. Department of Labor. (1970). *Manual for the USES General Aptitude Test Battery*, *Section III: Development*. Washington, DC: U.S. Government Printing Office.

U.S. Department of Labor. (1977). *Dictionary of occupational titles* (4th ed.). Washington, DC: U.S. Government Printing Office.

U.S. Department of Labor. (1991). *Dictionary of occupational titles* (Rev. 4th ed.). Washington, DC: U.S. Government Printing Office.

Weiss, D.J., Dawis, R.V., England, G.W., & Lofquist, L.H. (1964). Construct validation studies of the Minnesota Importance Questionnaire. *Minnesota Studies in Vocational Rehabilitation*, *18*.

# Appendix A

# Work Values Explanation Sheet for the WIP-C

## Work Values Explanation Sheet for the WIP-C

The Work Values Profiler is an attempt to measure your work values, or what you find important about work. In the future, this type of information may help to match people with jobs. The Profiler provides scores on six work values. The importance of each of these work values varies for different people. For example, for some people it may be important that a job provide an opportunity for advancement. For others, it may be important to have good working conditions. The more a job is able to provide people with things they want, the more satisfied they will be in their jobs.

The Work Values Profiler is in a research phase. Therefore, your scores on it *may* or *may not* be a true indication of your work values.

***Computer version scores.*** Higher work values tell what aspects of work are most important to you in an ideal job. Possible scores range from −4.0 to +4.0. Scores of +1.5 or above are considered ***high*** work values. Scores between +1.0 and +1.4 indicate ***moderate*** work values. Scores between 0 and +0.9 signify ***low*** work values. Scores below zero indicate work values of ***very low*** importance. The score of zero, or negative scores do not necessarily indicate an absence of the work value, only it may be less important to you than others in an ideal job.

***Card-sorting version scores.*** The six scores on the card sorting version of the Work Values Profiler range from 6 to 30. A score of 25 or higher is a ***high*** work value. A score of 18 to 24 is a ***moderate*** work value. Scores below 18 are ***low*** work values.

**COPY YOUR SCORES HERE**

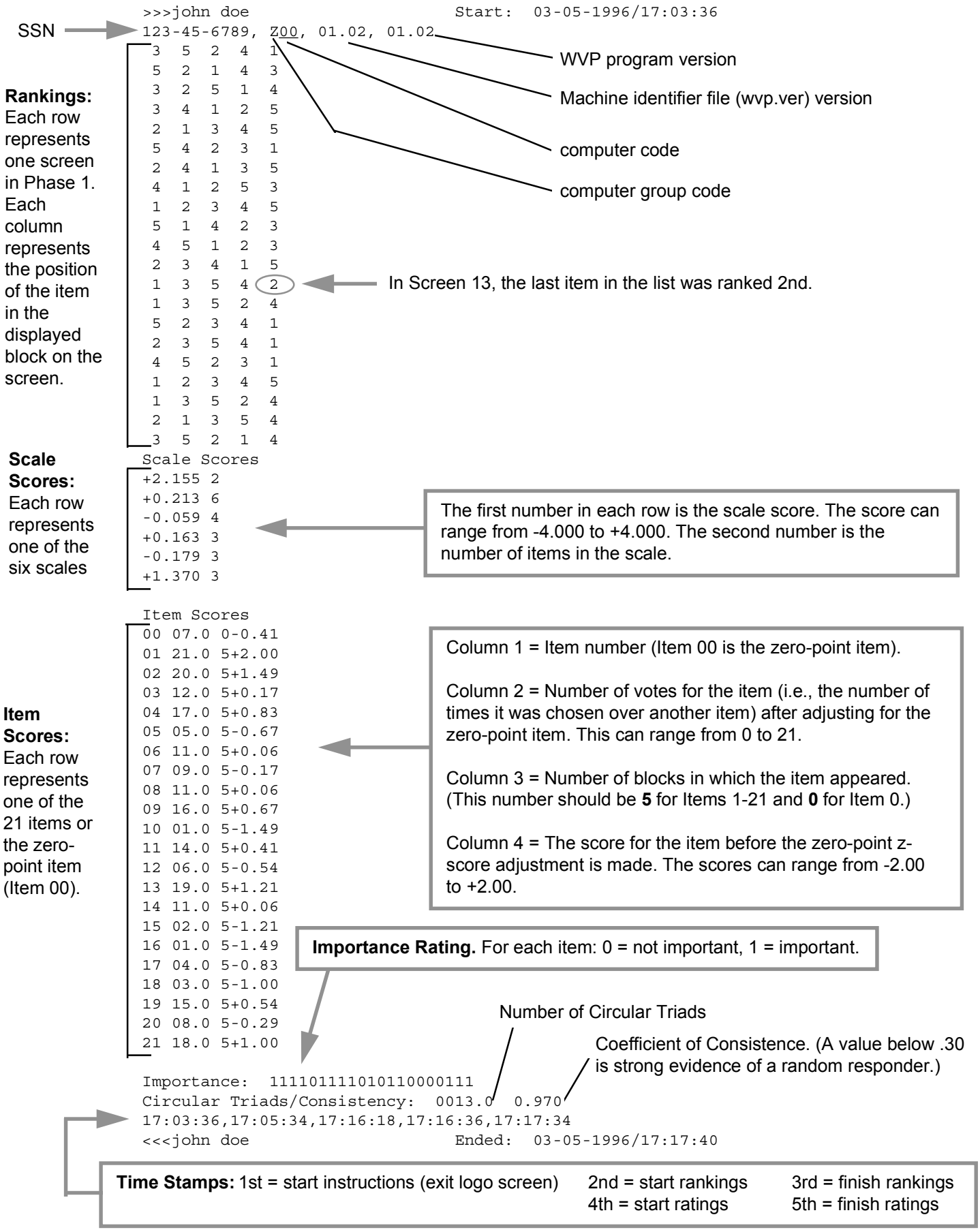
| Computer Version Scores | Card Sorting Version Scores | **Work Values Descriptions** |
|---|---|---|
| | | ***Work Value 1*: Achievement**. If you scored high for Work Value 1, it means that using your best abilities and feeling a sense of accomplishment is most important to you in an ideal job. Examples of occupations that satisfy people with a high Achievement work value are carpenter, commercial artist, cosmetologist, elementary school teacher, and programmer (business, engineering and science). |
| | | ***Work Value 2*: Working Conditions**. If you scored high for Work Value 2, it means that pay, job security, physical working conditions, and work that suits your temperament are most important to you in an ideal job. Examples of occupations that satisfy people with a high Conditions-of-Work value are farm equipment mechanic, locksmith, office machine servicer, pharmacist, and truck driver. |
| | | ***Work Value 3*: Recognition**. If you scored high for Work Value 3, it means that advancement, recognition, and respect are most important to you in an ideal job. Examples of occupations that satisfy people with a high Recognition work value are certified public accountant (CPA), family practitioner (MD), lawyer, newspaper publisher, and optometrist. |
| | | ***Work Value 4*: Relationships**. If you scored high for Work Value 4, it means that being of service to others, getting along with others, and having a clean conscience are most important to you in an ideal job. Examples of occupations that satisfy people with a high Relationships work value are case worker, home attendant, flight attendant, nurse, and school counselor. |
| | | ***Work Value 5*: Support**. If you scored high for Work Value 5, it means that having bosses who are both competent and considerate is most important to you in an ideal job. Examples of occupations that satisfy people with a high Support work value are automobile salesperson, telephone operator, bus driver, and telephone line installer/repairer. |
| | | ***Work Value 6*: Independence**. If you scored high for Work Value 6, it means that being able to exercise initiative and make decisions by yourself are most important to you in an ideal job. Examples of occupations that satisfy people with a high Independence work value are bill collector, engineer, interior designer, librarian, and occupational therapist. |

EARDC: 3/1/96

# Appendix B

# Layout of Data for One Subject for the WIP-C

## Layout of data for one subject in file workval.dat



# Appendix C

# Scoring Formulae for the WIP-C

# Scoring Formulae for the Computerized Work Values Profiler

## Overview

The Minnesota Importance Questionnaire (MIQ) comprises 21 statements (hereafter referred to as items). The MRO-5 (Multiple Rank Order with five items per block) format of the MIQ presents these items in 21 blocks of 5 items. Each item appears in five blocks and is presented with every other item.

The Computerized Work Importance Profiler (WIP-C) differs from the MIQ in two ways. First, the wording of several items has been modified to be consistent with the wording of the items in the Occupational Information Network (O*NET). Second, the MRO-5 versions of the WIP-C and MIQ differ in the order of the items in three of the blocks. The MIQ developers probably intended each item to appear in each position (i.e., 1, 2, 3, 4, or 5) in the blocks only once. Three items, however, each appear once in the wrong position. This was corrected in the WIP-C.

### Paired Comparisons *vs.* Ranks

The original form of the MIQ comprised all possible paired comparisons. The general formula for the number of paired comparisons is

$$\text{pairs} = \#\text{items}*(\#\text{items} - 1) / 2.$$

Thus, for the 21-item MIQ, the number of paired comparisons is:

$$\text{pairs} = 21*(21-1) / 2 = 210.$$

Rounds, Miller, and Dawis (1978) reported that the MRO version of the MIQ takes about half the time to complete (16 minutes) as the paired-comparison version (28 minutes). In addition, they reported that the correlation between the two versions (.883) is only marginally lower than the test-retest correlations (.931 for paired comparison, .916 for MRO-5).

In scoring paired-comparison tests, an item gets one vote each time it is chosen within a pair. The raw score for an item is its total number of votes. Each raw score can then be converted into the proportion of times the item got a vote relative to the number of pairs in which it appeared:

$$\text{proportion of times chosen} = \text{votes obtained} / \text{pairs appeared in}.$$

This proportion can then be converted to a *z*-score on a standard normal distribution.

MRO response data can be converted into paired-comparison response data. In the MRO-5 format, five items are ranked in each block. When examinees rank the five items, they are also implicitly making 10 paired comparisons among the items:

1 & 2
1 & 3
1 & 4
1 & 5
2 & 3
2 & 4
2 & 5
3 & 4
3 & 5
4 & 5.

An item is compared with each item in the block once. Thus, each of the five items in the block is involved in four comparisons. Thus, the maximum number of votes that an item can obtain in a block is

$$\text{maximum votes} = (\#\text{ items per block} - 1) = 5 - 1 = 4.$$

Because each item appears in five blocks, the maximum number of votes that an item can obtain is

$$\text{maximum votes per item} = \text{blocks / item} * (\text{maximum votes / item}) = 5 * 4 = 20.$$

## Converting Rank Data into Paired-Comparison Data

As mentioned above, MRO comparisons implicitly involve paired comparisons, allowing MRO data to be expressed as paired comparison data. Rank scores easily can be converted to paired-comparison data. For each item,

$$\begin{aligned} \text{votes} &= \text{maximum sum of ranks} - \text{sum of ranks} \\ &= 5 \text{ blocks} * 5 \text{ rank in each block} - \text{sum of ranks} \\ &= 25 - \text{sum of ranks.} \end{aligned}$$

Thus, for a 21-item test, the maximum votes possible is 25 - 5 * 1 = 20, and the minimum votes possible is 25 – (5 * 5) = 0.

**Scoring the WIP-C**

Scoring the WIP-C involves the following steps.

1. **Compute the sum of the ranks for each of the 21 items.**
2. **Convert the sum of ranks to votes according to the formula:**

votes = 25 - sum of ranks.

*Setting the Zero Point*

A key step in scoring the WIP-C is setting an absolute scale for each respondent. At the end of the test, each respondent rates each of the 21 needs (i.e., the 21 items) on a two-point scale (i.e., *Important* or *Not Important*). This information is used to set an individual's zero point for the scale so that each need's importance can be expressed in absolute terms.

The zero point is considered to be the imaginary 22nd item in the WIP-C. It is a derived item whose importance level is between the highest-ranked item that was rated *Not Important* and the lowest-ranked item that was rated *Important*. By definition, its adjusted *z*-score is zero.

3. **Compute the number of votes obtained by the zero-point item.**

votes = # items rated *Not Important*.

The proportion of possible votes obtained is computed for each item. Proportions of 0 and 1.00 will not convert to *z*-scores (their *z*-scores would be -_ and +_, respectively). This problem is circumvented in the following manner.

*Adjusting the Number of Votes*

Each item is considered to be compared with itself one time. Thus, for 21 items, 21 comparisons are being made for each item (1 comparison with itself and 20 comparisons with the other items). Because each item would be theoretically picked half of the time that it appeared with itself in a paired comparison, each item gets an additional half of a vote. Therefore, an item that is never chosen gets 0.5 votes, and an item that is always chosen gets 20.5 votes.

Two final adjustments involve the zero-point item. First, with the zero-point item added, there are really 22 items, and 22 comparisons are made for each item. Thus, the formula for the *proportion of times that an item is chosen* should use 22 in the denominator as the number of comparisons. Second, we can consider that the items rated *Important* were chosen over the zero-point item in the implied paired comparisons with the zero-point item. Therefore, the next step in the scoring is to adjust the number of votes for each *Important* item.

**4. Add one to the number of votes for each item rated *Important*.**

*Obtaining the Initial z-score*

The initial *z*-score is computed according to Table 1. This table was constructed according to the standard normal curve. The proportion values are shown but do not have to be computed during the scoring process. Instead, the *z*-score is obtained simply from the number of votes for an item.

**Table 1. Votes-to-*z*-Score Table**

| Votes | Votes Adjusted Votes | Paired Comparisons | Adjusted Votes / Comparisons | *z*-score |
|---|---|---|---|---|
| 0 | 0.5 | 22 | .0227 | -2.000 |
| 1 | 1.5 | 22 | .0682 | -1.489 |
| 2 | 2.5 | 22 | .1136 | -1.207 |
| 3 | 3.5 | 22 | .1591 | -0.998 |
| 4 | 4.5 | 22 | .2045 | -0.825 |
| 5 | 5.5 | 22 | .2500 | -0.674 |
| 6 | 6.5 | 22 | .2955 | -0.538 |
| 7 | 7.5 | 22 | .3409 | -0.410 |
| 8 | 8.5 | 22 | .3864 | -0.289 |
| 9 | 9.5 | 22 | .4318 | -0.172 |
| 10 | 10.5 | 22 | .4773 | -0.057 |
| 11 | 11.5 | 22 | .5227 | 0.057 |
| 12 | 12.5 | 22 | .5682 | 0.172 |
| 13 | 13.5 | 22 | .6136 | 0.289 |
| 14 | 14.5 | 22 | .6591 | 0.410 |
| 15 | 15.5 | 22 | .7045 | 0.538 |
| 16 | 16.5 | 22 | .7500 | 0.674 |
| 17 | 17.5 | 22 | .7955 | 0.825 |
| 18 | 18.5 | 22 | .8409 | 0.998 |
| 19 | 19.5 | 22 | .8864 | 1.207 |
| 20 | 20.5 | 22 | .9318 | 1.489 |
| 21 | 21.5 | 22 | .9773 | 2.000 |

**5. Obtain each item's *z*-score from the votes-to-*z*-score table.**

*Adjusting the z-score Using the Zero Points*

At this point, the *z*-scores for the items represent the *relative* importance of the values. The zero point is used now to translate the scores into an absolute scale. The *z*-score of the zero point item is set at zero, and the *z*-scores of all the other items are adjusted accordingly.

**6. Subtract the *z*-score of the zero-point item from each item's *z*-score. These are the items' final scores.**

**7. Compute the mean of the item scores in each subscale. These are the subscale scores.**

The WIP-C comprises six subscales that correspond to the six work values. The items constituting each subscale are shown in Table 2 by item number.

**Table 2. WIP-C Subscales and Constituent Items**

| Subscale Number | Subscale Name | Items |
|---|---|---|
| 1 | Achievement | |
| 2 | Comfort | |
| 3 | Status | |
| 4 | Altruism | |
| 5 | Safety | |
| 6 | Autonomy | |

*Circular Triads*

The consistency of a person's responses can be measured when a multiple-rank-order format or paired-comparison format is used. Inconsistencies appear as *circular triads*. Consider three items (A, B, C) in a 22-item paired-comparison format. Assume that a respondent chooses A over B and B over C. If the respondent is consistent, he or she will choose A over C. If the respondent chooses C over A, then the respondent has been inconsistent and a circular triad exists (i.e., A over B, B over C, C over A). Because the rankings given in a multiple-rank-order format also imply paired comparisons, responses in multiple-rank-order tests can also generate circular triads.

Several formulae are presented related to circular triads. The nomenclature for these formulae is as follows:

$d$ = the number of circular triads in the test
$n$ = the number of items in the test
$a_i$ = the number of votes for the $i^{th}$ item in the test.

The general formula for the number of circular triads, *d*, is

$$d = \frac{\frac{1}{6} n(n-1)(2n-1) - \sum_{i=1}^{n} a_i^2}{2}.$$

**8. Compute the number of circular triads according to the formula.**

For the WIP-C, the equation used to calculate the number of circular triads takes the following form:

$$d = \frac{\frac{1}{6} 22(22-1)(2\times 22-1) - \sum_{i=1}^{n} a_i^2}{2} = 1{,}655.5 - \frac{1}{2}\sum_{i=1}^{22} a_i^2 .$$

*Coefficient of Consistence*

There are several statistics that measure the degree of response consistency as a function of the number of circular triads. Given the MRO-5 format, the WIP-C uses the simplest of these statistics_the *coefficient of consistence*. The formula for the coefficient of consistence is

$$\varsigma = \frac{\#\, circular\ triads\ in\ test}{\max\ possible\ \#\ of\ triads}.$$

The maximum possible number of circular triads is computed as

$$d_{\max} = \begin{cases} \frac{n}{24}(n^2-4) & when\ n\ is\ even \\ \frac{n}{24}(n^2-1) & when\ n\ is\ odd \end{cases}.$$

**9. Compute the coefficient of consistence.**

For the WIP-C, the equation used to calculate the coefficient of consistence takes the following form:

$$\varsigma = 1 - \frac{\#\,circular\,triads}{\frac{22}{24}(22^2 - 4)} = 1 - \frac{\#\,circular\,triads}{440}\ .$$

## Reference

Rounds, Jr., J.B., Miller, T.W., & Dawis, R.V. (1978). Comparability of multiple rank order and paired comparison methods. *Applied Psychological Measurement*, *2*, 415-422.

## Bibliography

Gay, E.G., Weiss, D.J., Hendel, R.V., & Lofquist, L.H. (1971). *Manual for the Minnesota Importance Questionnaire*. Minneapolis, MN: University of Minnesota.

Ghiselli, E.E., Campbell,J.P., & Zedeck, S. (1981). *Measurement theory for the behavioral sciences*. San Francisco: W. H. Freeman and Company.

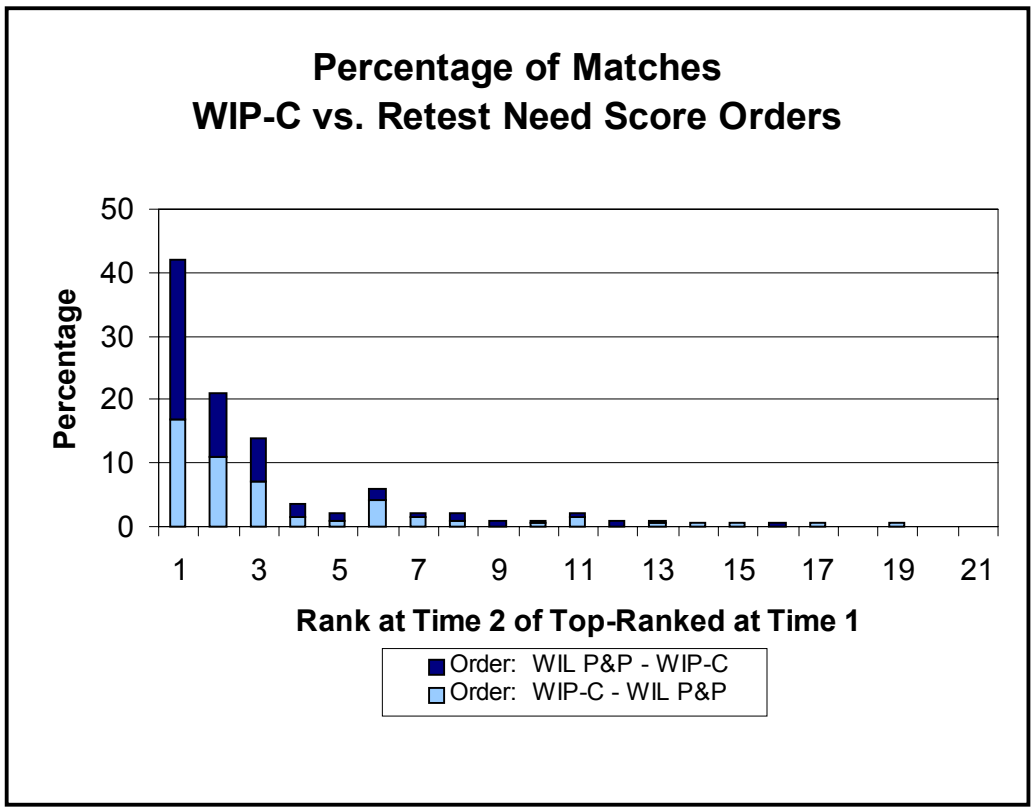
Gulliksen, H., & Tucker, L.R. (1961). A general procedure for obtaining comparisons from multiple rank orders. *Psychometrika*, *26*, 173-183.

# Appendix D

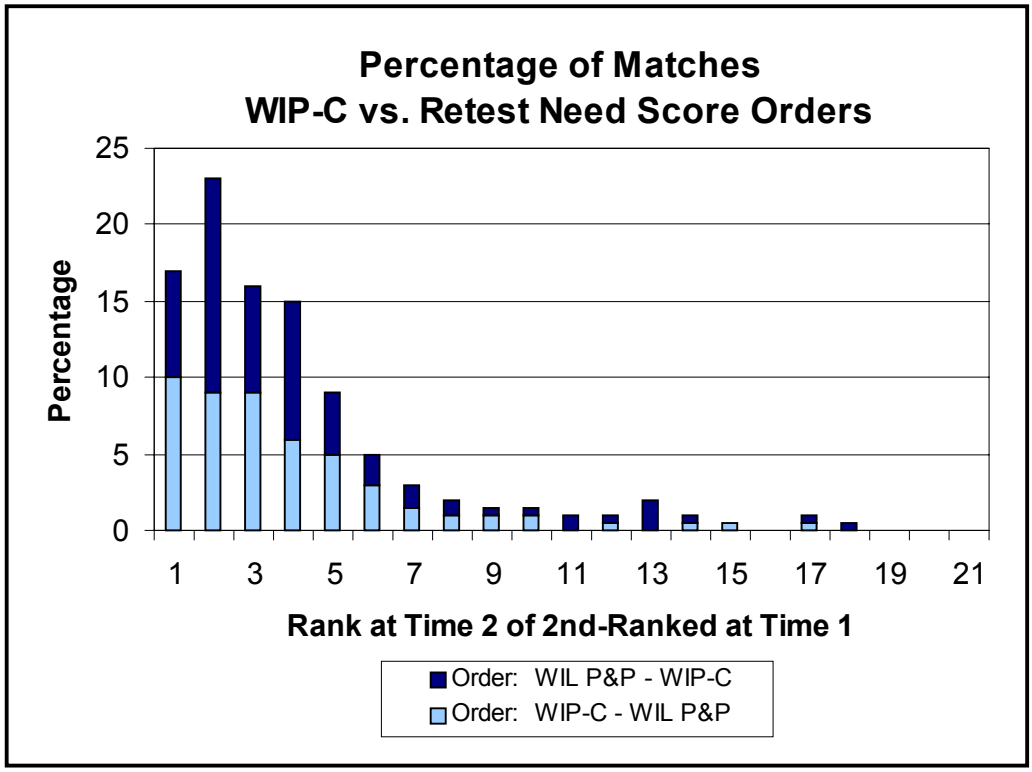
# Histograms Showing Test-Retest Results

**Histograms Showing Test-Retest Results for the Need Statements on the WIP-C**

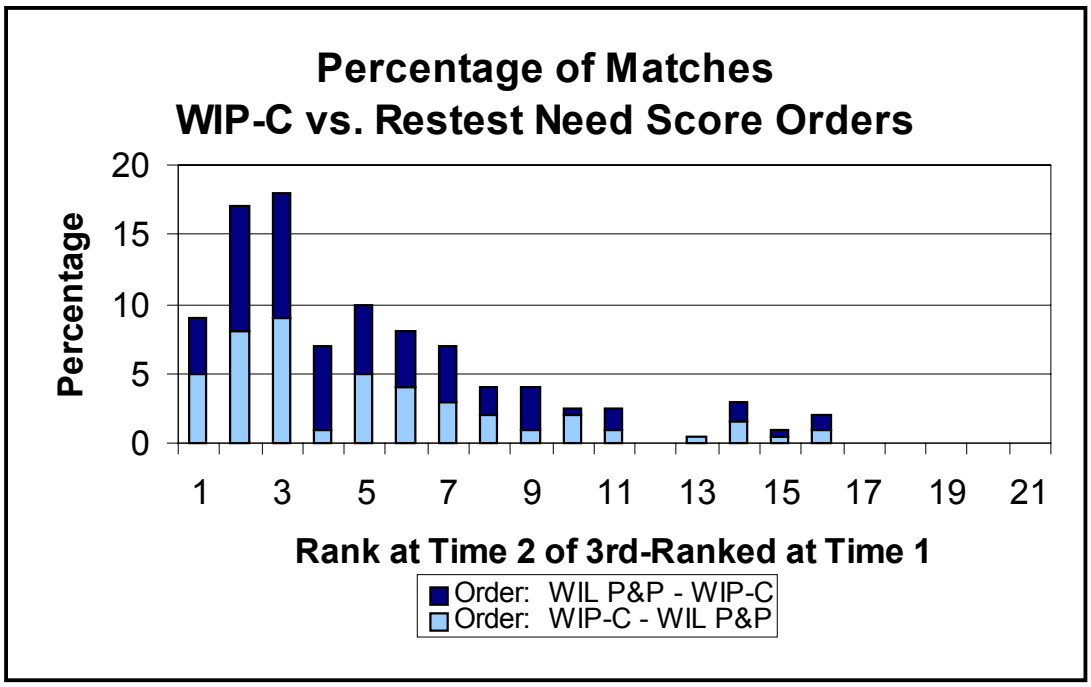
The following set of histograms indicates whether the individual need statements ranked by the respondents were given the same rank the first time the respondent took the WIP-C and the second time the respondent took the WIP-C. The first histogram examines whether or not the need statements which were top-ranked at Time 1 were also top ranked at Time 2. The second histogram examines the same question for need statements ranked second at the two times. The third, fourth, and fifth histograms examine the same question for the third-, fourth-, and fifth-ranked need statements. The frequency tables that follow the histograms show the numerical values on which the histograms were based. The histograms are stacked to indicate the order in which the examinees had taken the WIL-P&P and the WIP-C. The histograms demonstrate that the version of the WIP-C an examinee completed first had little effect on the similarity of rankings of the needs across time (i.e., there is little order effect).



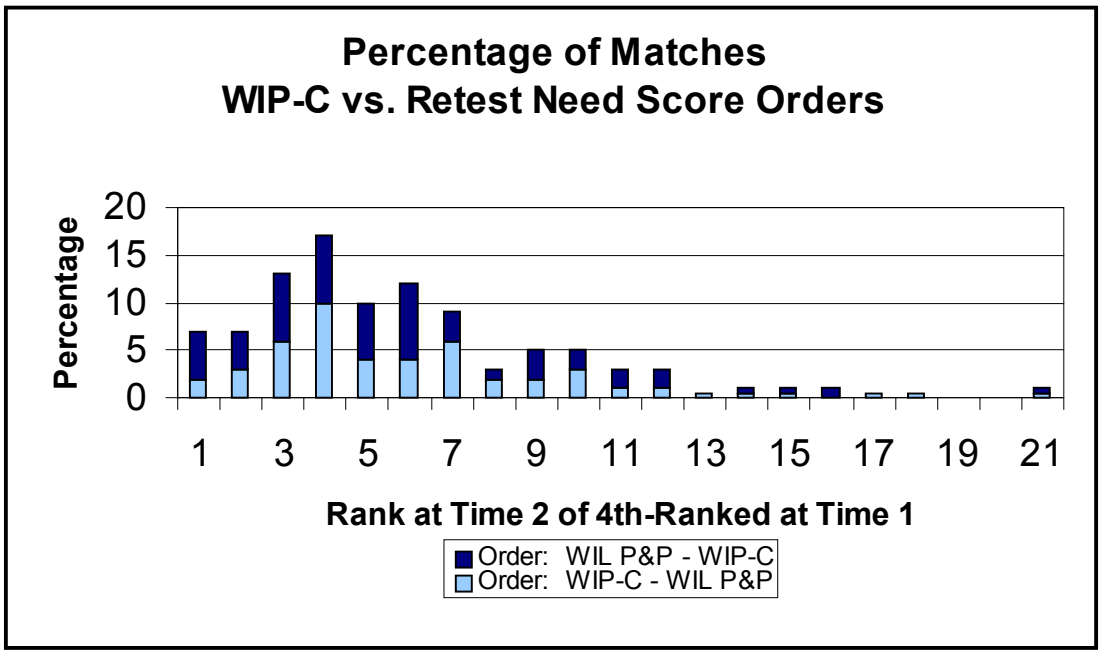

**Histogram 1: Rank at Time 2 of Top-Ranked WIP-C Need at Time 1**



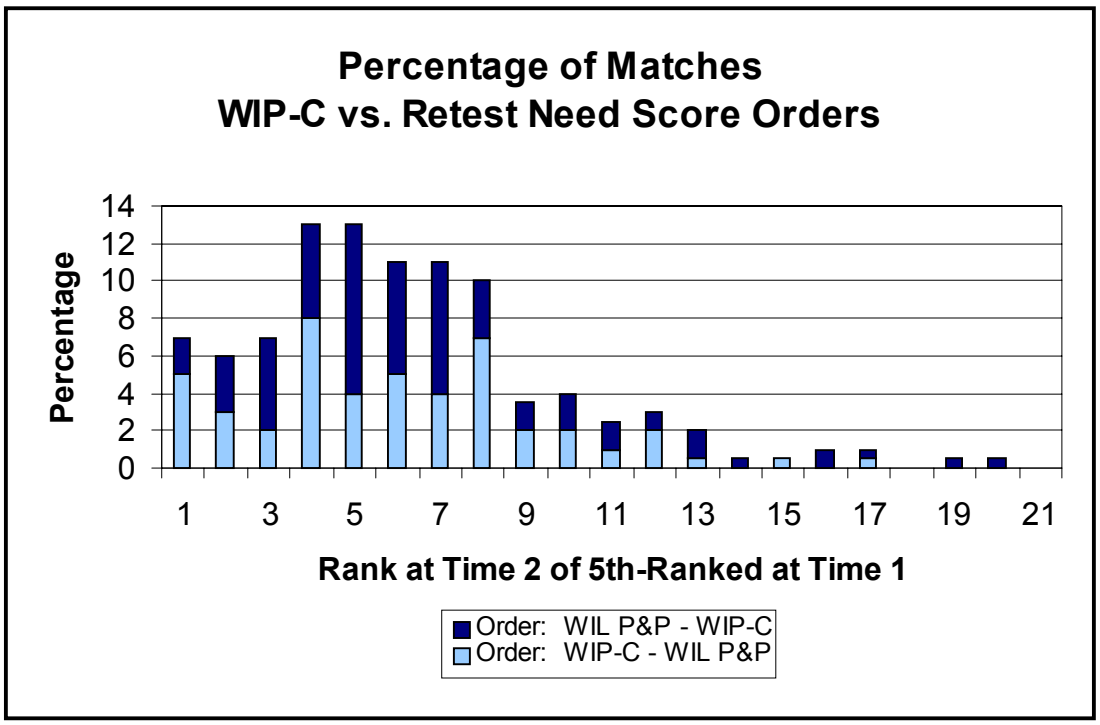

**Histogram 2: Rank at Time 2 of 2nd-Ranked WIP-C Need at Time 1**




**Histogram 3: Rank at Time 2 of 3rd-Ranked WIP-C Need at Time 1**




**Histogram 4: Rank at Time 2 of 4th-Ranked WIP-C Need at Time 1**




**Histogram 5: Rank at Time 2 of 5th-Ranked WIP-C Need at Time 1**

## Percentage of Matches of WIP-C Test vs. Retest Need Score Orders

| Frequency Table for Histogram 1 | | | | |
|---|---|---|---|---|
| Test Order: WIP-C then WIL P&P | | | | Rank at Time 2 of Top-Ranked at Time 1 |
| C12RANK1 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| 1 | 35 | 35.4 | 35 | 35.4 |
| 2 | 23 | 23.2 | 58 | 58.6 |
| 3 | 14 | 14.1 | 72 | 72.7 |
| 4 | 3 | 3.0 | 75 | 75.8 |
| 5 | 2 | 2.0 | 77 | 77.8 |
| 6 | 8 | 8.1 | 85 | 85.9 |
| 7 | 3 | 3.0 | 88 | 88.9 |
| 8 | 2 | 2.0 | 90 | 90.9 |
| 10 | 1 | 1.0 | 91 | 91.9 |
| 11 | 3 | 3.0 | 94 | 94.9 |
| 13 | 1 | 1.0 | 95 | 96.0 |
| 14 | 1 | 1.0 | 96 | 97.0 |
| 15 | 1 | 1.0 | 97 | 98.0 |
| 17 | 1 | 1.0 | 98 | 99.0 |
| 19 | 1 | 1.0 | 99 | 100.0 |

## Percentage of Matches of WIP-C Test vs. Retest Need Score Orders

| Frequency Table for Histogram 1 (continued) | | | | |
|---|---|---|---|---|
| **Test Order: WIL-P&P then WIP-C** | | | **Rank at Time 2 of Top-Ranked at Time 1** | |
| **C12RANK1** | **Frequency** | **Percent** | **Cumulative Frequency** | **Cumulative Percent** |
| 1 | 51 | 48.1 | 51 | 48.1 |
| 2 | 20 | 18.9 | 71 | 67.0 |
| 3 | 14 | 13.2 | 85 | 80.2 |
| 4 | 4 | 3.8 | 89 | 84.0 |
| 5 | 2 | 1.9 | 91 | 85.8 |
| 6 | 4 | 3.8 | 95 | 89.6 |
| 7 | 1 | 0.9 | 96 | 90.6 |
| 8 | 2 | 1.9 | 98 | 92.5 |
| 9 | 2 | 1.9 | 100 | 94.3 |
| 10 | 1 | 0.9 | 101 | 95.3 |
| 11 | 1 | 0.9 | 102 | 96.2 |
| 12 | 2 | 1.9 | 104 | 98.1 |
| 13 | 1 | 0.9 | 105 | 99.1 |
| 16 | 1 | 0.9 | 106 | 100.0 |

## Percentage of Matches of WIP-C Test vs. Retest Need Score Order

| Frequency Table for Histogram 2 | | | | |
|---|---|---|---|---|
| Test Order: WIP-C then WIL-P&P | | | Rank at Time 2 of 2nd-Ranked at Time 1 | |
| C12RANK2 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| 1 | 21 | 21.2 | 21 | 21.2 |
| 2 | 18 | 18.2 | 39 | 39.4 |
| 3 | 18 | 18.2 | 57 | 57.6 |
| 4 | 12 | 12.1 | 69 | 69.7 |
| 5 | 10 | 10.1 | 79 | 79.8 |
| 6 | 7 | 7.1 | 86 | 86.9 |
| 7 | 3 | 3.0 | 89 | 89.9 |
| 8 | 2 | 2.0 | 91 | 91.9 |
| 9 | 2 | 2.0 | 93 | 93.9 |
| 10 | 2 | 2.0 | 95 | 96.0 |
| 12 | 1 | 1.0 | 96 | 97.0 |
| 14 | 1 | 1.0 | 97 | 98.0 |
| 15 | 1 | 1.0 | 98 | 99.0 |
| 17 | 1 | 1.0 | 99 | 100.0 |

## Percentage of Matches of WIP-C Test vs. Retest Need Score Orders

| Frequency Table for Histogram 2 (continued) | | | | |
|---|---|---|---|---|
| Test Order: WIL-P&P then WIP-C | | | Rank at Time 2 of 2nd-Ranked at Time 1 | |
| C12RANK2 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| 1 | 15 | 14.2 | 15 | 14.2 |
| 2 | 29 | 27.4 | 44 | 41.5 |
| 3 | 15 | 14.2 | 59 | 55.7 |
| 4 | 18 | 17.0 | 77 | 72.6 |
| 5 | 8 | 7.5 | 85 | 80.2 |
| 6 | 4 | 3.8 | 89 | 84.2 |
| 7 | 3 | 2.8 | 92 | 86.8 |
| 8 | 2 | 1.9 | 94 | 88.7 |
| 9 | 1 | 0.9 | 95 | 89.6 |
| 10 | 1 | 0.9 | 96 | 90.6 |
| 11 | 2 | 1.9 | 98 | 92.5 |
| 12 | 1 | 0.9 | 99 | 93.4 |
| 13 | 4 | 3.8 | 103 | 97.2 |
| 14 | 1 | 0.9 | 104 | 98.1 |
| 17 | 1 | 0.9 | 105 | 99.1 |
| 18 | 1 | 0.9 | 106 | 100.0 |

## Percentage of Matches of WIP-C Test vs. Retest Need Score Orders

| Frequency Table for Histogram 3 | | | | |
|---|---|---|---|---|
| Test Order: WIP-C then WIL-P&P | | | Rank at Time 2 of 3rd-Ranked at Time 1 | |
| C12RANK3 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| 1 | 11 | 11.1 | 11 | 11.1 |
| 2 | 17 | 17.2 | 28 | 28.3 |
| 3 | 18 | 18.2 | 46 | 46.5 |
| 4 | 2 | 7.1 | 53 | 53.5 |
| 5 | 11 | 11.1 | 64 | 64.6 |
| 6 | 9 | 9.1 | 73 | 73.7 |
| 7 | 7 | 7.1 | 80 | 80.8 |
| 8 | 5 | 5.1 | 85 | 85.9 |
| 9 | 2 | 2.0 | 87 | 87.9 |
| 10 | 4 | 4.0 | 91 | 91.9 |
| 11 | 2 | 2.0 | 93 | 93.9 |
| 13 | 1 | 1.0 | 94 | 94.9 |
| 14 | 3 | 3.0 | 97 | 98.0 |
| 15 | 1 | 1.0 | 98 | 99.0 |
| 16 | 2 | 1.0 | 99 | 100.0 |

## Percentage of Matches of WIP-C Test vs. Retest Need Score Orders

| Frequency Table for Histogram 3 (continued) | | | | |
|---|---|---|---|---|
| Test Order: WIL-P&P then WIP-C | | | Rank at Time 2 of 3rd-Ranked at Time 1 | |
| C12RANK3 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| 1 | 9 | 8.5 | 9 | 8.5 |
| 2 | 19 | 17.9 | 28 | 26.4 |
| 3 | 18 | 17.0 | 46 | 43.4 |
| 4 | 13 | 12.3 | 59 | 55.7 |
| 5 | 10 | 9.4 | 69 | 65.1 |
| 6 | 9 | 8.5 | 78 | 73.6 |
| 7 | 8 | 7.5 | 86 | 81.1 |
| 8 | 4 | 3.8 | 90 | 84.9 |
| 9 | 6 | 5.7 | 96 | 90.6 |
| 10 | 1 | 0.9 | 97 | 91.5 |
| 11 | 3 | 2.8 | 100 | 94.3 |
| 14 | 3 | 2.8 | 103 | 97.2 |
| 15 | 1 | 0.9 | 104 | 98.1 |
| 16 | 2 | 1.9 | 106 | 100.0 |

## Percentage of Matches of WIP-C Test vs. Retest Need Score Orders

| Frequency Table for Histogram 4 | | | | |
|---|---|---|---|---|
| Test Order: WIP-C then WIL-P&P | | | Rank at Time 2 of 4th-Ranked at Time 1 | |
| C12RANK4 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| 1 | 5 | 5.1 | 5 | 5.1 |
| 2 | 7 | 7.1 | 12 | 12.1 |
| 3 | 12 | 12.1 | 24 | 24.2 |
| 4 | 21 | 21.2 | 45 | 45.5 |
| 5 | 9 | 9.1 | 54 | 54.5 |
| 6 | 8 | 8.1 | 62 | 62.6 |
| 7 | 12 | 12.1 | 74 | 74.7 |
| 8 | 4 | 4.9 | 78 | 78.8 |
| 9 | 5 | 5.1 | 83 | 83.8 |
| 10 | 6 | 6.1 | 89 | 89.9 |
| 11 | 2 | 2.0 | 91 | 91.9 |
| 12 | 2 | 2.0 | 93 | 93.9 |
| 13 | 1 | 1.0 | 94 | 94.9 |
| 14 | 1 | 1.0 | 95 | 96.0 |
| 15 | 1 | 1.0 | 96 | 97.0 |
| 17 | 1 | 1.0 | 97 | 98.0 |
| 18 | 1 | 1.0 | 98 | 99.0 |
| 21 | 1 | 1.0 | 99 | 100.0 |

## Percentage of Matches of WIP-C Test vs. Retest Need Score Orders

| Frequency Table for Histogram 4 (continued) | | | | |
|---|---|---|---|---|
| Test Order: WIL-P&P then WIP-C | | | Rank at Time 2 of 4th-Ranked at Time 1 | |
| C12RANK4 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| 1 | 10 | 9.4 | 10 | 9.4 |
| 2 | 8 | 7.5 | 18 | 17.0 |
| 3 | 14 | 13.2 | 32 | 30.2 |
| 4 | 14 | 13.2 | 46 | 43.4 |
| 5 | 12 | 11.3 | 58 | 54.7 |
| 6 | 16 | 15.1 | 74 | 69.8 |
| 7 | 6 | 5.7 | 80 | 75.5 |
| 8 | 2 | 1.9 | 82 | 77.4 |
| 9 | 7 | 6.6 | 89 | 84.0 |
| 10 | 4 | 3.8 | 93 | 87.7 |
| 11 | 4 | 3.8 | 97 | 91.5 |
| 12 | 4 | 3.8 | 101 | 95.3 |
| 14 | 1 | 0.9 | 102 | 96.2 |
| 15 | 1 | 0.9 | 103 | 97.2 |
| 16 | 2 | 1.9 | 105 | 99.1 |
| 21 | 1 | 0.9 | 106 | 100.0 |

## Percentage of Matches of WIP-C Test vs. Retest Need Score Orders

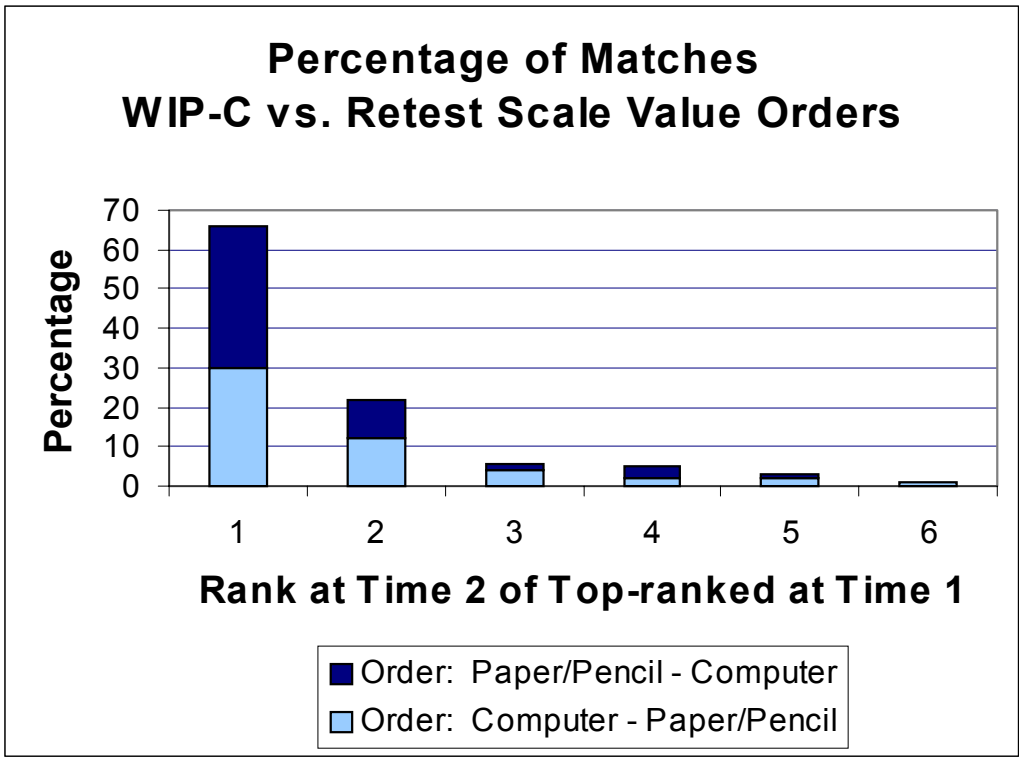
| Frequency Table for Histogram 5 | | | | |
|---|---|---|---|---|
| Test Order: WIP-C then WIL-P&P | | | Rank at Time 2 of 5th-Ranked at Time 1 | |
| C12RANK5 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| 1 | 11 | 11.1 | 11 | 11.1 |
| 2 | 7 | 7.1 | 18 | 18.2 |
| 3 | 5 | 5.1 | 23 | 23.2 |
| 4 | 16 | 16.2 | 39 | 39.4 |
| 5 | 9 | 9.1 | 48 | 48.5 |
| 6 | 10 | 10.1 | 58 | 58.6 |
| 7 | 9 | 9.1 | 67 | 67.7 |
| 8 | 14 | 14.1 | 81 | 81.8 |
| 9 | 4 | 4.0 | 85 | 85.9 |
| 10 | 5 | 5.1 | 90 | 90.9 |
| 11 | 2 | 2.0 | 92 | 92.9 |
| 12 | 4 | 4.0 | 96 | 97.0 |
| 13 | 1 | 1.0 | 97 | 98.0 |
| 15 | 1 | 1.0 | 98 | 99.0 |
| 17 | 1 | 1.0 | 99 | 100.0 |

## Percentage of Matches of WIP-C Test vs. Retest Need Score Orders

| Frequency Table for Histogram 5 (continued) | | | | |
|---|---|---|---|---|
| Test Order: WIL-P&P then WIP-C | | | Rank at Time 2 of 5th-Ranked at Time 1 | |
| C12RANK5 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| 1 | 4 | 3.8 | 4 | 3.8 |
| 2 | 7 | 6.6 | 11 | 10.4 |
| 3 | 11 | 10.4 | 22 | 20.8 |
| 4 | 11 | 10.4 | 33 | 31.1 |
| 5 | 18 | 17.0 | 51 | 48.1 |
| 6 | 12 | 11.3 | 63 | 59.4 |
| 7 | 15 | 14.2 | 78 | 73.6 |
| 8 | 6 | 5.7 | 84 | 79.2 |
| 9 | 3 | 2.8 | 87 | 82.1 |
| 10 | 5 | 4.7 | 92 | 86.8 |
| 11 | 3 | 2.8 | 95 | 89.6 |
| 12 | 2 | 1.9 | 97 | 91.5 |
| 13 | 3 | 2.8 | 100 | 94.3 |
| 14 | 1 | 0.9 | 101 | 95.3 |
| 16 | 2 | 1.9 | 103 | 97.2 |
| 17 | 1 | 0.9 | 104 | 98.1 |
| 19 | 1 | 0.9 | 105 | 99.1 |
| 20 | 1 | 0.9 | 106 | 100.1 |

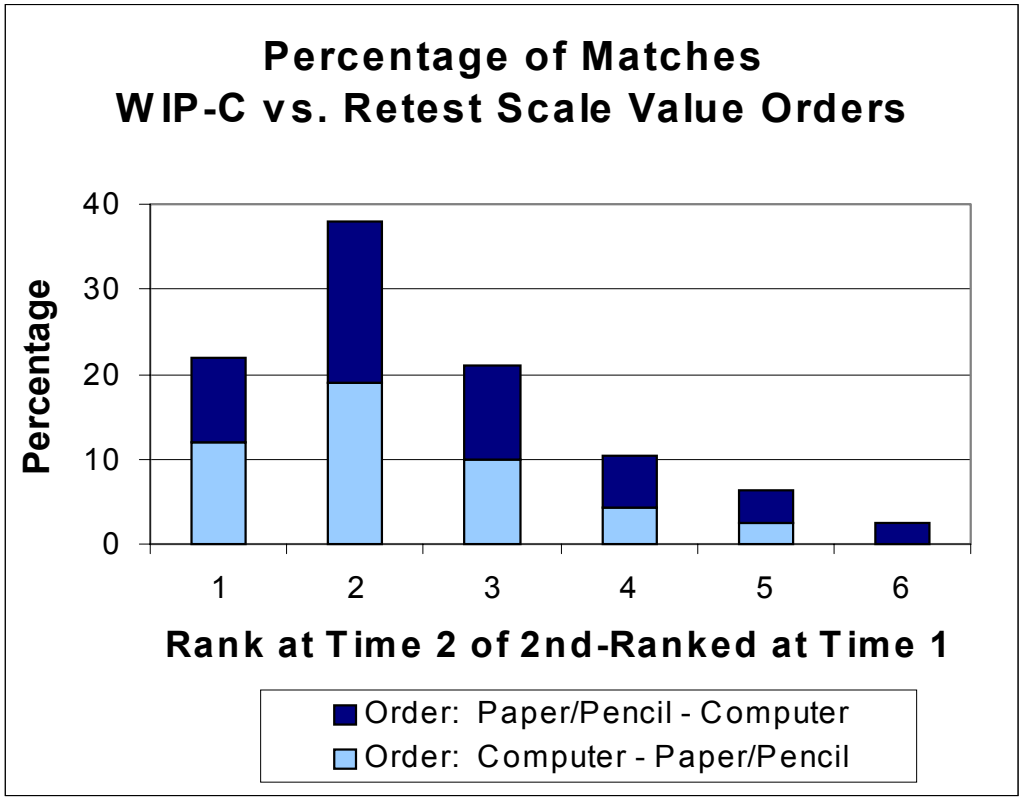
**Histograms Showing Test-Retest Results for the Six Values on the WIP-C**

Each of the six values on the WIP-C was based on the combination of the individual need statements that were related to that value based on the theoretical development of the MIQ. The following set of histograms indicates whether the value scores were ranked the same the first time the respondent took the WIP-C and the second time the respondent took the WIP-C. The first histogram examines whether or not the value which a respondent rated at the top at Time 1 was also top ranked by the respondent at Time 2. The second histogram examines the same question for values ranked second at the two times. The frequency tables that follow the histograms show the numerical values on which the histograms were based. The histograms are stacked to indicate the order in which the examinees had taken the WIL-P&P and the WIP-C. The histograms demonstrate that the version of the WIP-C an examinee completed first had little effect on the similarity of rankings of the values across time (i.e., there is little order effect).




**Histogram 1: Rank at Time 2 of Top-Ranked WIP-C Value at Time 1**

**Histogram 2: Rank at Time 2 of 2nd Ranked WIP-C Value at Time 1**



## Percentage of Matches of WIP-C Test vs. Retest Scale Value Orders

| Frequency Table for Histogram 1 | | | | |
|---|---|---|---|---|
| **Test Order: WIP-C then WIL-P&P** | | | | **Rank at Time 2 of Top-Ranked at Time 1** |
| **C12RANK1** | **Frequency** | **Percent** | **Cumulative Frequency** | **Cumulative Percent** |
| 1 | 61 | 61.6 | 61 | 61.6 |
| 2 | 24 | 24.2 | 85 | 85.9 |
| 3 | 9 | 9.1 | 94 | 94.9 |
| 4 | 2 | 2.0 | 96 | 97.0 |
| 5 | 2 | 2.0 | 98 | 99.0 |
| 6 | 1 | 1.0 | 99 | 100.0 |
| **Test Order: WIL-P&P then WIP-C** | | | | **Rank at Time 2 of Top-Ranked at Time 1** |
| 1 | 74 | 69.8 | 74 | 69.8 |
| 2 | 21 | 19.8 | 95 | 89.6 |
| 3 | 3 | 2.8 | 98 | 92.5 |
| 4 | 6 | 5.7 | 104 | 98.1 |
| 5 | 2 | 1.9 | 106 | 100.0 |
| **Frequency Table for Histogram 2** | | | | |
| **Test Order: WIP-C then WIL-P&-P** | | | | **Rank at Time 2 of 2nd-Ranked at Time 1** |
| **C12RANK2** | **Frequency** | **Percent** | **Cumulative Frequency** | **Cumulative Percent** |
| 1 | 25 | 25.3 | 25 | 25.3 |
| 2 | 38 | 38.4 | 63 | 63.6 |
| 3 | 21 | 21.2 | 84 | 84.8 |
| 4 | 9 | 9.1 | 93 | 93.9 |
| 5 | 5 | 5.1 | 98 | 99.0 |
| 6 | 1 | 1.0 | 99 | 100.0 |
| **Test Order: WIL-P&P then WIP-C** | | | | **Rank at Time 2 of 2nd-Ranked at Time 1** |
| 1 | 20 | 18.9 | 20 | 18.9 |
| 2 | 39 | 36.8 | 59 | 55.7 |
| 3 | 22 | 20.8 | 81 | 76.4 |
| 4 | 12 | 11.3 | 93 | 87.7 |
| 5 | 8 | 7.5 | 101 | 95.3 |
| 6 | 5 | 4.7 | 106 | 100.0 |