ACT Interest Inventory Technical Manual

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1
Overview of the ACT® Interest Inventory

The purpose of this technical manual is to provide readers with information about the development and psychometric characteristics of the Unisex Edition of the ACT Interest Inventory (UNIACT). The information summarized here is based on research–published and unpublished–conducted by ACT staff from 1972 to the present. (References to non-ACT-sponsored published research involving UNIACT are listed in Appendix A.) While this manual summarizes some of the information found in prior versions of the manual (ACT, 1981, 1995), the primary focus is on research conducted from 1995 to 2008.

Redevelopment and renorming of UNIACT was conducted in 2002–2006. For readers already familiar with UNIACT, the new edition features comparable validity with fewer items. Specifically, the total number of items has been reduced from 90 to 72. Redevelopment leading to the new edition of UNIACT, and the development of norms for the new edition, are described in Chapters 2 and 3, respectively. Chapters 4, 5, and 6 describe recent research pertaining to UNIACT validity and reliability. Because an increasing number of studies have examined the relationship between interest-occupation (and interest-major) congruence and a variety of outcome variables, this manual also describes recent congruence-outcome studies involving UNIACT.

Editions of the ACT Interest Inventory

The first edition of the ACT Interest Inventory was introduced in 1971, with subsequent editions introduced in 1973 and 1974. The first *unisex* edition of the ACT Interest Inventory (UNIACT) was introduced in 1977, with subsequent editions introduced in 1989 and 2004. When discussing a particular edition of UNIACT, we differentiate it by an added letter. In this manual, we refer to the initial UNIACT as UNIACT-A. The next edition, introduced in 1989, is referred to as UNIACT-R (ACT, 1995). The current edition, first introduced in ACT programs in the fall of 2004, is referred to in this manual as UNIACT-S. Like UNIACT-R, UNIACT-S has two levels. The Level 1 (high school) version is intended for students in grades 8–12, and the Level 2 (college/adult) version is intended for postsecondary students and adults. Unless specified otherwise, references to UNIACT-R or UNIACT-S pertain to Level 1. Throughout this manual, we use the term *UNIACT* to refer to all UNIACT editions as a group.

Each edition of UNIACT has considerable item overlap with the prior edition. Levels 1 and 2 of UNIACT-R share 64% and 62% of the original UNIACT-A items, respectively (ACT, 1995). As described in Chapter 2, all 72 items in the Level 1 UNIACT-S are found in the Level 1 UNIACT-R (one item was modified for clarity), and all 72 of the Level 2 UNIACT-S items are found in the Level 1 UNIACT-R (eight items were modified to make them more appropriate for adults). As described in Chapter 4, the UNIACT-R and UNIACT-S scales share very similar structural properties. For these reasons, this manual includes technical information from all three UNIACT editions in summarizing the validity and utility of the current edition.

UNIACT provides scores for six basic types of vocational interests paralleling the six career types in Holland's (1997) theory of careers, and has a long history of doing so. The ACT Guidance Profile (ACT, 1968), developed under the direction of John Holland, served as the foundation for the early editions of the ACT Interest Inventory. Research on career assessment has been conducted at ACT for more than 40 years. Early work involved the construction of vocational assessment instruments (ACT, 1968; 1972), the identification of Holland's hexagon and refinement of Holland's system for classifying occupations (Holland, Whitney, Cole, & Richards, 1969; Cole, Whitney, & Holland, 1971), and analyses of the basic structure of vocational interests (Cole, 1973; Cole & Hanson, 1971). Additional information about the history of the ACT Interest Inventory can be found in the prior edition of the UNIACT technical manual (ACT, 1995).

ACT Programs with a UNIACT Component

As of this writing, UNIACT-R or UNIACT-S is a component of the following six ACT programs:

- The ACT is a comprehensive system of data collection and reporting designed to help high school students develop postsecondary educational plans and to help postsecondary educational institutions meet the needs of their students. Besides a battery of four tests of educational achievement, the ACT also collects a range of additional information, such as students' career interests (via UNIACT-S, Level 1) and aspirations. The ACT helps students explore personally relevant career options (both educational and occupational) as they make the transition from high school to college.
- PLAN® is an every-student program that assesses academic progress at (typically) the tenth- and eleventh-grade levels, helps students understand and explore the wide range of career options available, and assists them in making adjustments in their high school course work to ensure that they are prepared for their post–high school goals. Student interests are assessed via UNIACT-S, Level 1. High schools use the data in academic advising and counseling.
- EXPLORE® is an every-student program that assesses academic progress at (typically) the eighth- and ninth-grade levels, helps students understand and begin to explore the wide range of career options available, and assists them in developing a high school coursework plan that prepares them to achieve their post–high school goals. EXPLORE contains many of the same elements as PLAN. Student interests are assessed via UNIACT-S, Level 1.
- DISCOVER® is a career planning system that provides guidance and information to help people make career and educational decisions. For grades 7–12, student interests are assessed via UNIACT-R, Level 1. For college students and adults, interests are assessed via UNIACT-R, Level 2. In addition to assessing vocational interests, DISCOVER also assesses work-relevant values and abilities. There are two versions of DISCOVER: an Internet version and a Windows® version.
- The Career Planning Survey™ is a comprehensive career guidance program that prepares students (grades 8–10) to make informed education and career decisions. Student interests are assessed via UNIACT-R, Level 1. A version of the Career Planning Survey for Japan uses a Japanese version of UNIACT-R.
- The WorkKeys® Fit Assessment measures an individual's interests and values, providing information that can help determine how well a job candidate matches the occupations in an organization. Interests are assessed via UNIACT-S, Level 2. This online assessment is one of three WorkKeys Personal Skills Assessments.

UNIACT is completed each year by about 4 million students in grades 8–12, and another half million postsecondary students and adults. With about 4.5 million administrations per year, it continues to be the most used interest inventory in the world. Since 1971, the ACT Interest Inventory has been administered over 100 million times–a significant milestone in the history of psychological testing.

Description of UNIACT

UNIACT is intended for use by people who are in the early stages of career planning or replanning. The primary purpose of UNIACT is to stimulate and facilitate exploration of self in relation to careers, and to help individuals identify personally relevant educational and occupational (career) options. As career choices become more complex, one of the most difficult tasks faced by adolescents, or by adults considering a career change, is the identification of career options appropriate to personal goals and characteristics. An important goal in career counseling is to provide such individuals with a panoramic view of their options in the worlds of work and education, and then to help them find their way in these worlds. Perhaps the most appropriate term for this task is "focused exploration" (Prediger, 1974). UNIACT provides focus for career exploration; not a focus that singles out the "right" occupation, but rather one that points to a range of options that individuals may want to explore. In the process of exploration, individuals may discover things about themselves, as well as educational and occupational options, that they had not previously considered.

Career exploration and decision making are developmental processes. Individuals, to some degree, explore self in relation to careers and identify personally relevant career options whether they are exposed to measured interest feedback or not. Thus the purpose of UNIACT is not to initiate or complete this process, but rather to promote and advance this process by providing accurate, personally relevant information. In addition, it is important to keep in mind that personal relevance can involve far more than just measured interests. Ultimately only individuals can determine what is most relevant to them.

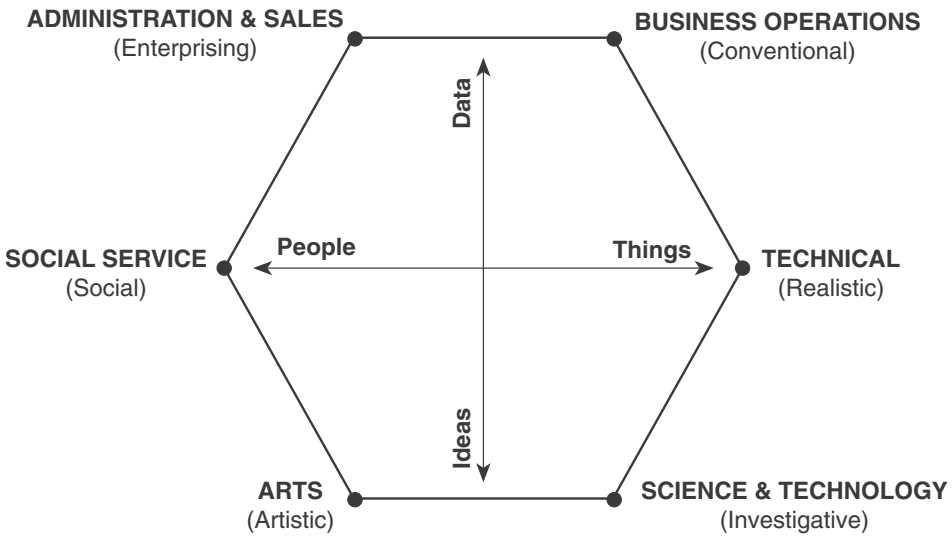
Basic Interest Scales

To facilitate exploration, UNIACT results are reported for six basic types of vocational interests paralleling the six occupational and interest types in Holland's (1997) theory of careers. UNIACT-S scale names and descriptions (with corresponding Holland types and their abbreviations indicated in parentheses) are:

- Science & Technology (Investigative – I)
  Investigating and attempting to understand phenomena in the natural sciences through reading, research, and discussion.
- Arts (Artistic – A)
  Expressing oneself through activities such as painting, designing, singing, dancing, and writing; artistic appreciation of such activities (e.g., listening to music, reading literature).
- Social Service (Social – S)
  Helping, enlightening, or serving others through activities such as teaching, counseling, working in service-oriented organizations, and engaging in social/political studies.
- Administration & Sales (Enterprising – E)
  Persuading, influencing, directing, or motivating others through activities such as sales, supervision, and aspects of business management.
- Business Operations (Conventional – C)
  Developing and/or maintaining accurate and orderly files, records, accounts, etc.; following systematic procedures for performing business activities.
- Technical (Realistic – R)
  Working with tools, instruments, and mechanical or electrical equipment. Activities include building, repairing machinery, and raising crops/animals.

As shown in Figure 1.1, the theoretical relationships among Holland's six types (Investigative, Artistic, Social, Enterprising, Conventional, and Realistic) can be represented by a hexagon. According to Holland's theory, types adjacent on the hexagon (e.g., Social and Artistic) resemble each other most, while types on opposite sides of the hexagon (e.g., Artistic and Conventional) resemble each other least. UNIACT scale titles (Arts, Social Service, etc.) correspond to ACT *career clusters*. As discussed later in this chapter, the six career clusters provide a simple yet comprehensive organizational structure for occupations in the world of work.

Figure 1.1
Relationship between UNIACT scales and the Data/Ideas and People/Things Work Task Dimensions.



Note. Holland types corresponding to UNIACT scales are shown in parentheses.

Item Content

UNIACT-S instructions and items are shown in Appendix B. There are 12 items per scale and a three-choice response format (*like, dislike, indifferent*) is used. Items emphasize work-relevant activities (e.g., sketch and draw pictures, build a picture frame, help settle an argument between friends) that are familiar to people, either through participation or observation (firsthand or vicarious). As discussed below, items were constructed with the goal that the distributions of career options suggested to males and females would be similar. In addition, items contain few job duties and no occupational titles. As noted by Kuder (1977), the more help people need with career planning, the less likely they are to have knowledge about various occupations–or their "knowledge" may be inaccurate. Hence, interest inventories using occupational titles or job duties may not help the people who need it most. In addition, occupational titles and job duties carry a prestige subtext that clouds the measurement of interests. While important in its own right, prestige is an occupational attribute that some people value, not an activity that some people like to do.

Gender-Balanced Scales

While gender segregation in the workforce has diminished over the past few decades, women continue to be underrepresented in some occupational fields, many involving higher pay and status (Gabriel & Schmitz, 2007; Wootton, 1997). Gender differences in workforce composition contribute to differences in gender-role socialization, and these long-standing differences are often reflected in responses to interest inventory items (Betz, 1992; 2006; Osborn & Reardon, 2004). For example, fewer females than males are likely to report that they would enjoy using computer models to test machines or structures. One of the important goals in completing an interest inventory is to widen the range of career options for exploration, particularly when some options have traditionally been restricted (Lonborg & Hackett, 2006). Thus many authors have encouraged counselors to consider ways to avoid reinforcing traditional gender socialization roles when using interest inventories (e.g., Lonborg & Hackett, 2006; Whiston & Bouwkamp, 2003). Because of these concerns, UNIACT was carefully developed to minimize differences in the career options suggested to males and females. This *gender-balance* approach differs from the *gender-restrictive* approach taken in the development of some interest inventories.

Gender-restrictive scores. Males and females respond to interest inventory items in characteristically different ways. When items with large male-female differences are used to develop interest inventory scales, the distributions of raw scores obtained by males and females are usually systematically different and gender stereotypic. As a result, gender-restrictive (Prediger & Hanson, 1974) career options are suggested to males and females. A typical outcome is that females are referred to a narrower set of career options. For example, about 50% of females score highest on the Social scale of the Student-Directed Search (Holland, Powell, & Fritzsche, 1997). The other 50% are distributed across the remaining five scales. Given the overrepresentation of females in service occupations (Gabriel & Schmitz, 2007), the possibility of reinforcing traditional gender roles is evident. In addition, gender-restrictive scores can attenuate validity, as described below.

Gender-balanced scores. Gender-balanced scores can be achieved in two ways. A common method is to use same-sex norms. When interest inventory scores are based on same-sex norms, males and females receive highly similar, gender-balanced interest profiles. For example, the same-sex norms approach is used with the occupational scales of the Strong Interest Inventory (Donnay, Morris, Schaubhut, & Thompson, 2005). The same-sex norms approach has been criticized for treating males and females differently (e.g., Holland, Powell, & Fritzsche, 1997).

The other approach, the one taken with UNIACT, is to control for gender differences at the item level. As described in Chapter 2, items are used that assess basic interests while also displaying minimal gender differences. Because males and females obtain similar distributions of scores, combined-gender norms can be used to obtain gender-balanced interest profiles. These gender-balanced (unisex) scales have the added benefit of enhancing the validity of the instrument. The prior edition of the UNIACT technical manual summarizes the results of 14 studies comparing the counseling-related validity of gender-restrictive and gender-balanced Holland-type scores (ACT, 1995, p. 15). In all studies, the validity for gender-balanced scores was at least as high as that for gender-restrictive scores, and in most studies the validity of gender-balanced scores was higher.

The Data/Ideas and People/Things Work Task Dimensions

UNIACT results reported to students are represented visually on the ACT World-of-Work Map. This map, described in the next section, provides a unique, visual means for linking the interests of individuals to occupations. But first we discuss the dimensions that permit this linkage, and summarize the empirical support for these dimensions.

One of the challenges with any psychological assessment is converting scores to useful counseling information. With respect to interest inventory results, providing counselees with valid and meaningful career options requires a bridge between what the inventory measures and what workers do. For UNIACT, the Data/Ideas and People/Things Work Task Dimensions serve as that bridge. Research shows that these two bipolar dimensions underlie (a) Holland-type interests of individuals, (b) Holland-type interests of career groups, and (c) job analysis ratings of occupations. Support for these dimensions is extensive and based on diverse types of data. Commensurate dimensions underlying both the interests of individuals and the tasks of workers permit information about a person's interests to be translated into occupational information, and vice versa. The relationship between these dimensions and the hexagonal ordering of Holland's career types (1997) is shown in Figure 1.1.

Definitions of the data, ideas, people, and things work tasks follow:

- **Data** (facts, records, files, numbers, systematic procedures for facilitating goods/services consumption by people). "Data activities" involve *impersonal processes* such as recording, verifying, transmitting, and organizing facts or data representing goods and services. Purchasing agents, accountants, and air traffic controllers work *mainly* with data.
- **Ideas** (abstractions, theories, knowledge, insights, and new ways of expressing something–for example, with words, equations, or music). "Ideas activities" involve *intrapersonal processes* such as creating, discovering, interpreting, and synthesizing abstractions or implementing applications of abstractions. Scientists, musicians, and philosophers work *mainly* with ideas.
- **People** (no alternative terms). "People activities" involve *interpersonal processes* such as helping, informing, serving, persuading, entertaining, motivating, and directing–in general, producing a change in human behavior. Teachers, salespersons, and nurses work *mainly* with people.
- **Things** (machines, mechanisms, materials, tools, physical and biological processes). "Things activities" involve *nonpersonal processes* such as producing, transporting, servicing, and repairing. Bricklayers, farmers, and engineers work *mainly* with things.

Research support. Extensive evidence shows that the Data/Ideas and People/Things Work Task Dimensions summarize the correlations between the Holland-type scores of individuals (e.g., ACT, 1995; Rounds, 1995; Day, Rounds, & Swaney, 1998; Prediger, 1982; Prediger, 1996; Swaney, 2003; Swaney & Flojo, 2001; Tracey, 2002), between the Holland-type scores of career groups (Prediger & Swaney, 2004), and between the Holland-type inventory item responses of individuals (Day & Rounds, 1998). A wide range of age groups is represented in these studies (grade 6 to adult), and several of these studies are quite large. In addition, a series of studies have repeatedly shown that the Data/Ideas and People/Things Work Task Dimensions are essentially independent. Correlations between scores on these two dimensions range near zero for both interests (ACT, 1981, 1995; Prediger, 1982; Prediger & Swaney, 2004) and work tasks (Prediger, 1981, 2002; Prediger & Swaney, 2004). Two studies supporting the Data/Ideas and People/Things Work Task Dimensions are summarized below.

The scale structure of the 72-item UNIACT-S was examined by Swaney (2003) for samples of 20,000 eighth graders, 20,000 tenth graders, and 20,000 twelfth graders. For all three grade levels, the data/ideas and people/things targeted factors accounted for nearly all of the variance (96–100%) that could be accounted for by any two interest dimensions. In addition, the patterns of correlations between the targeted factors and the six UNIACT-S scales were consistent with theory, indicating that the underlying dimensions were data/ideas and people/things.

Evidence also shows that the Data/Ideas and People/Things Work Task Dimensions underlie the interests of career groups. Support is based on a study involving 640 career groups across six samples (Prediger & Swaney, 2004). For each sample, scale structure analyses on the Holland-type mean interests of the career groups revealed that the data/ideas and people/things targeted factors accounted for nearly all of the variance (96–98%) that could be accounted for by any two interest dimensions.

The evidence presented above pertains to interest inventory results of people and career groups. For the Data/Ideas and People/Things Work Task Dimensions to serve as a bridge from interests to occupations, support is needed for commensurate dimensions

underlying the tasks of workers. The dimensions underlying expert ratings of occupations were recently examined by Prediger & Swaney (2004). They conducted scale structure analyses on ratings of the six Holland types of work environments for each of 1,122 O*NET occupations (Rounds, Smith, Hubert, Lewis, & Rivkin, 1998). As expected, the data/ideas and people/things targeted factors accounted for nearly all (97%) of the variance that could be accounted for by any two factors. The pattern of correlations between the targeted factors and ratings on the six Holland types was consistent with theory, indicating that the dimensions underlying the expert ratings were Data/Ideas and People/Things Work Task Dimensions. Earlier studies have also shown that the Data/Ideas and People/Things Work Task Dimensions summarize the expert ratings of occupations (Prediger, 1981, 1982). These studies represent a wide range of occupations–almost 15,000 in all.

Taken together, these results indicate that these two work task dimensions have substantial explanatory power. Research support is extensive and based on diverse types of data and units of analysis (people, groups, occupations). The Data/Ideas and People/Things Work Task Dimensions provide a convenient, empirical structure for summarizing similarities and differences among occupations–indeed, it is difficult to imagine more basic work tasks than working with data, ideas, people, and things. These work tasks provide the conceptual bridge from Holland-type interests to occupations, helping to explain why Holland-type scores "work." No other orientation of orthogonal dimensions has been shown to underlie both Holland-type interests and the work tasks of people in occupations.

ACT Occupational Classification System

The ACT Occupational Classification System provides the overall structure used to organize occupations in many ACT programs. The components of the classification system were designed to serve two functions. First, they provide a simple yet comprehensive overview of a work world comprised of thousands of different occupations. Second, they help counselees view their personal characteristics in world-of-work terms. The latter is possible because UNIACT scores and the basic work tasks of occupations share the same underlying structure: the Data/Ideas and People/Things Work Task Dimensions. The ACT Occupational Classification System is based on this empirical bridge from interests to occupations. This kind of occupational classification system has marked advantages over systems developed independently of assessment. Without an empirical connection to assessment-based information, the utility of occupational classification systems for career exploration purposes is limited. Conversely, without the empirical connection to occupations, the utility of assessment-based information for career exploration purposes is limited. Even an interest inventory with impressive construct validity has limited utility if the bridge to occupations is tenuous.

Career Clusters and Career Areas

At the most general level, counselees are introduced to six career clusters that are similar in nature to the occupational groups described by Holland (1997). At the second level of specificity, each career cluster subsumes from three to seven *career areas*. The 26 career areas provide comprehensive coverage of all U.S. occupations. ACT career clusters and career areas (with example occupations) are shown in Figure 1.2.

The World-of-Work Map (Third Edition)

Because the world of work is complex, people engaged in career exploration benefit from gaining a clear sense of direction. This is especially true for people in the early stages of career exploration. A good map can help them find their way among thousands of occupations. An occupational map can also facilitate career development by providing the structure and schema needed to make sense of a wide range of career-relevant experiences in the middle school, high school, and college years.

The ACT World-of-Work Map (Figure 1.3) provides a simple yet comprehensive overview of the world of work and provides a visual means for linking UNIACT scores to career options. The 26 career areas are located in 12 map *regions* that represent various combinations of data, ideas, people, and things work tasks. Career areas are located on the World-of-Work Map according to the relative standing of their member occupations on the Data/Ideas and People/Things Work Task Dimensions. Career area locations on the map are based on three sources of information: (a) expert ratings for all occupations in the U.S. Department of Labor (DOL) O*NET database, (b) job analysis data for more than 1,500 occupations in the DOL's *Dictionary of Occupational Titles*, and (c) Holland-type interest scores of people pursuing 640 occupations (Prediger & Swaney, 2004). The purpose of the work, and the work setting, were also considered when the career areas were formed.

Although care was taken to make each career area as homogeneous as possible, there is scatter across the occupations in each career area. The scatter could be reduced by the use of more career areas, but the World-of-Work Map was constructed to be useful for counselees and is not meant to provide a precise

scientific statement. As can be seen in Figure 1.3, career area locations generally make good theoretical and common sense. Additional information about the development of the third edition of the World-of-Work Map can be found in Prediger and Swaney (2004).

A student's UNIACT scores can be used to obtain scores on the Data/Ideas and People/Things Work Task Dimensions that underlie the World-of-Work Map. On ACT, PLAN, and EXPLORE score reports, a student's map location is reported in terms of two or three map regions, not an exact coordinate point. The use of map regions facilitates focused exploration and is in keeping with the level of precision inherent in the scores. Map regions reflect the relation between Holland's types and the two underlying work task dimensions. For example, high-ranking scores for the Arts or the Science & Technology scales indicate an interest in ideas-related work tasks. Thus, map regions are based on the *pattern* of a person's scores. Because the dimensions underlying the map underlie any measure of Holland's six career types, any set of Holland-type scores can be located on the World-of-Work Map. Conversion of Holland-type scores to map regions is discussed in Appendix C.

Figure 1.2
The ACT career area list.

ADMINISTRATION & SALES CAREER CLUSTER

A. Employment-Related Services
Employee Benefits Manager; Employment Interviewer; Human Resources Manager; Training/Education Manager

B. Marketing & Sales
Advertising Manager; Buyer; Insurance Agent; Real Estate Agent; Sales/Marketing Manager; Travel Agent

C. Management
Financial Manager; Foreign Service Officer; General Manager/Top Executive; Hotel/Motel Manager; Property/Real Estate Manager

D. Regulation & Protection
Customs Inspector; Detective (Police); FBI/CIA Agent; Food and Drug Inspector; Park Ranger; Police Officer

BUSINESS OPERATIONS CAREER CLUSTER

E. Communications & Records
Abstractor; Court Reporter; Hotel Clerk; Medical Record Technician; Title Examiner/Searcher

F. Financial Transactions
Accountant/Auditor; Bank Teller; Budget/Credit Analyst; Insurance Underwriter; Real Estate Appraiser; Tax Accountant

G. Distribution & Dispatching
Air Traffic Controller; Flight Dispatcher; Mail Carrier; Shipping/Receiving Clerk; Warehouse Supervisor

TECHNICAL CAREER CLUSTER

H. Transport Operation & Related
Aircraft Pilot; Astronaut; Bus Driver; Locomotive Engineer; Ship Captain; Truck Driver (Tractor Trailer)

I. Agriculture, Forestry & Related
Aquaculturist; Farm Manager; Forester; Nursery/Greenhouse Manager; Tree Surgeon (Arborist)

J. Computer & Information Specialties
Actuary; Archivist/Curator; Computer Programmer; Computer Systems Analyst; Web Site Developer

K. Construction & Maintenance
Carpenter; Electrician (Construction); Firefighter; Plumber; Security System Installer

L. Crafts & Related
Cabinetmaker; Chef/Cook; Jeweler; Tailor/Dressmaker; Winemaker

M. Manufacturing & Processing
Printing Press Operator; Sheet Metal Worker; Tool and Die Maker; Water Plant Operator; Welder

N. Mechanical & Electrical Specialties
Locksmith; Millwright; Technicians in various fields (for example, Automotive, Avionics, Broadcast, Sound)

SCIENCE & TECHNOLOGY CAREER CLUSTER

O. Engineering & Technologies
Architect, Engineers (for example, Civil, Mechanical) and Technicians (for example, Energy Conservation, Quality Control) in various fields; Surveyor

P. Natural Science & Technologies
Biologist; Food Technologist; Geologist; Meteorologist; Physicist

Q. Medical Technologies
Dietician/Nutritionist; Optician; Pharmacist; Radiographer Technologists in various fields (for example, Medical, Surgical)

R. Medical Diagnosis & Treatment
Anesthesiologist; Dentist; Nurse Practitioner; Physical Therapist; Physician; Veterinarian

S. Social Science
Anthropologist; Criminologist; Political Scientist; Experimental Psychologist; Sociologist

ARTS CAREER CLUSTER

T. Applied Arts (Visual)
Animator; Fashion Designer; Graphic Artist (Software); Photographer; Set Designer

U. Creative & Performing Arts
Actor; Composer (Music); Dancer/Choreographer; Fashion Model; Musician (Instrumental); Writer/Author

V. Applied Arts (Written & Spoken)
Advertising Copywriter; Columnist; Editor; Interpreter; Librarian; Reporter/Journalist

SOCIAL SERVICE CAREER CLUSTER

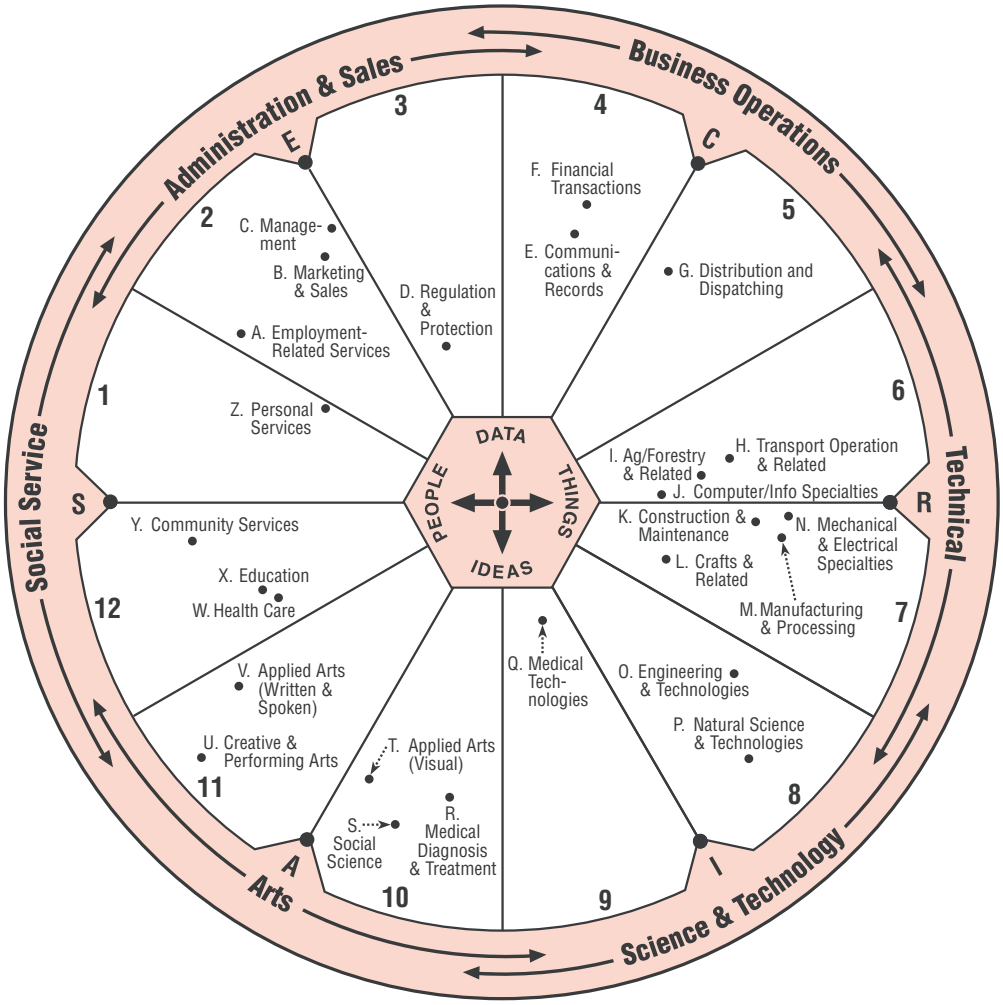
W. Health Care
Athletic Trainer; Dental Hygienist; Health Services Administrator; Psychiatric Technician; Recreational Therapist

X. Education
Athletic Coach; College/University Faculty; Educational Administrator; Teachers in various specialties (for example, Art, Foreign Language, Music)

Y. Community Services
Counselors in various specialties (for example, Mental Health, Rehabilitation); Director (Social Service); Lawyer; Social Worker

Z. Personal Services
Barber; Flight Attendant; Gaming Occupations Worker; Hairstylist/Cosmetologist

Figure 1.3
The third edition of the World-of-Work Map (counselor's version).



About the Map

- The World-of-Work Map arranges 26 career areas (groups of similar jobs) into 12 regions. Together, the career areas cover all U.S. jobs. Most jobs in a career area are located near the point shown. However, some may be in adjacent Map regions.
- A career area's location is based on its primary work tasks. The four primary work tasks are working with—

  DATA: Facts, numbers, files, accounts, business procedures.

  IDEAS: Insights, theories, new ways of saying or doing something—for example, with words, equations, or music.

  PEOPLE: People you help, serve, inform, care for, or sell things to.

  THINGS: Machines, tools, living things, and materials such as food, wood, or metal.
- Six general types of work (career clusters) and related Holland types (RIASEC) are shown around the edge of the Map. The overlapping career cluster arrows indicate overlap in the occupational content of adjacent career clusters.
- Because they are more strongly oriented to People than Things, the following two career areas in the Science & Technology cluster are located toward the left side of the Map (Region 10): Medical Diagnosis & Treatment and Social Science.

2
UNIACT Development

The purpose of this chapter is to describe the redevelopment of UNIACT-S undertaken in 2002–2006. Two factors led to the decision to redevelop the instrument. First, periodic empirical review of psychological instruments is essential to determine whether revision is needed (American Educational Research Association, 1999), as item content may become outdated over time due to changes in society. While research conducted since the last revision had generally shown impressive item functioning, several items no longer functioned as intended (e.g., see Day and Rounds, 1998). Second, given ACT's movement toward greater reliance on Web-based administration, we sought to reduce UNIACT administration time while maintaining the instrument's current level of validity and reliability. Because the redevelopment process involved selecting the highest-functioning subset of items from the prior (then current) edition of UNIACT, the development of past editions of UNIACT is relevant and briefly summarized below.

Summary of UNIACT Development: 1975–1989

Development of UNIACT-A began with a substantial pool of items already in various editions of the ACT Interest Inventory. Added to this pool were items written to capture the essence of various work-related activities. Item selection, involving data from six different samples (grade 9 through adults, more than 10,000 people total), was based primarily on correlations between items and preliminary scales, as well as indices of gender balance. These steps led to a final set of 90 items (15 per scale). This initial edition of UNIACT, intended for people in high school through adulthood, was introduced in 1977. Additional information on UNIACT-A development is found in ACT (1981).

Redevelopment of UNIACT-A, leading to the two levels of UNIACT-R introduced in 1989, involved both new item development and current item review/selection. New items were developed from three sources. Lists of activities, later converted to items by ACT staff, were written by (a) high school students, (b) college students, and (c) ACT employees representing a variety of work settings. Additional items were selected from item pools of past ACT Interest Inventory editions. Review of UNIACT-A item functioning was examined using four samples (grade 8 through adult, more than 6,700 people total), and item functioning of all current and new items was examined using three samples (grade 9 through adult, more than 8,000 people). Guidelines for evaluating items, shown in Table 2.1, focused on item-scale correlations, scale structure, and gender balance. These steps led to a final set of 90 items (15 per scale) for both the Level 1 (high school) and Level 2 (college/adult) versions of UNIACT-R. The two levels of UNIACT-R shared 68 items in common. UNIACT-A was the source of 58 Level 1 UNIACT-R items and 56 Level 2 UNIACT-R items. Same-scale correlations between UNIACT-A and UNIACT-R ranged from .88 to .98 for a nationwide sample of grade 12 students. Additional information on UNIACT-R development is found in ACT (1995, chap. 3).

UNIACT-S Development

This section describes the steps taken to develop the current edition of UNIACT, called UNIACT-S. As of this writing, the instrument is used in several ACT programs, such as EXPLORE, PLAN, the ACT, and the WorkKeys Fit Assessment. Both the Level 1 and Level 2 versions of UNIACT-S consist of the 72 best-functioning items from UNIACT-R, the prior edition of the instrument. This section describes how UNIACT-R items were evaluated, selected, and (in a few cases) modified for use in UNIACT-S. Specifically, this section lays out the guidelines used to evaluate and select items, the samples involved, the outcomes of the review and selection process, and the reasons for revising some items.

Performance and Content Guidelines

Performance guidelines for evaluating item functioning and selecting UNIACT-S items are listed in Table 2.1. These guidelines are identical to those used in 1988 for the development of UNIACT-R (ACT, 1995). The decision to retain these guidelines was based on a literature review, conducted in 2001, of common criteria used in the development and review of comparable interest inventories. No reasons were found to modify the guidelines. For Guideline 8, a panel of tenth grade students was convened to provide feedback on items. Students identified items that people their own age may be unfamiliar with, or may not fully understand.

Samples

Analyses examining item performance were conducted on samples of students in grades 8, 10, and 12, as well as a sample of adults. All four samples, described in Table 2.2 (Samples A–D), were obtained from ACT data files and had complete sets of Level 1 UNIACT-R items. Level 1 UNIACT-R items served as the source of both Level 1 and Level 2 UNIACT-S items. The decision to use Level 1 UNIACT-R items as the source of Level 2 UNIACT-S items was based on the need for a large sample of adults (and demographic information) with which to develop nationally representative norms (see Chapter 3). Such a sample was available from ACT program files.

Results

Item performance guidelines were applied to item statistics, and item content guidelines were applied via professional judgment (informed by student input for Guideline 8). Performance results indicated that 14 of 90 UNIACT-R items failed to meet at least one guideline for grades 8–12, whereas 9 of 90 failed to meet at least one guideline for adults. Of the 14 failing items for grades 8–12, 13 failed to meet a gender balance guideline. Content results indicated that 9 of 90 UNIACT-R items failed to meet at least one guideline for grades 8–12, whereas 4 of 90 failed to meet at least one guideline for adults.

Table 2.1
UNIACT Item Redevelopment: Empirical Performance and Item Content Guidelines

Guideline	Item
	Item Performance
1.	The corrected correlation between an item and its own scale should be $\geq .30$[a].
2.	The corrected correlation between an item and its own scale should exceed the correlations with scales that are non-adjacent in terms of Holland's hexagonal model (Holland, 1997) of scale relationships.[a]
3.	If the corrected correlation between an *item* and its own scale is exceeded by its correlation with an adjacent scale (in terms of Holland's model), the item's own *scale* should exhibit a lower correlation with this adjacent scale than with the other adjacent scale. The purpose of this guideline is to retain items that contribute to reducing observed disparities in correlations between scales and their adjacent scales.
4.	An item should display an absolute difference of $<.15$ in the proportion of *like* responses for males and females.
5.	The proportion of responses to an item should exceed .05 for each response category (*dislike*, *indifferent*, *like*).
	Item Content
6.	Items containing or strongly implying occupational titles should not be used.
7.	Activities in items should not be so specific to particular occupations as to be little understood by people who have not had experience in those occupations. Examples of past UNIACT items eliminated by this guideline were "Work in a science lab" and "Manage a small business."
8.	Items that are unfamiliar to high school students (on the basis of feedback from a student panel) should not be used (applies only to Level 1).
9.	Items that are not appropriate for adults, due to item content intended for students, should be excluded or revised (applies only to Level 2).

Note. [a] All correlations between an item and its own scale were "corrected," i.e., the item was removed from its assigned scale.

Table 2.2
UNIACT-S Samples

Sample	*N*	Educational level	Description of sample
			Item Selection
A	3,000	Grade 8	A sample of grade 8 students who completed the EXPLORE program during the 2000–01 academic year. Every 90th male was selected, up to 1,500, and every 91st female was selected, up to 1,500.
B	3,000	Grade 10	A sample of grade 10 students who completed the PLAN program during the 2000–01 academic year. Every 206th male was selected, up to 1,500, and every 233rd female was selected, up to 1,500.
C	3,000	Grade 12	A sample of grade 12 students who completed the ACT program in April of 2001. Records were sorted in ascending order by identification number and selected, in sort order, up to 1,500 males and 1,500 females. Records with extreme patterns were bypassed.
D	4,019	Adults	A sample of 4,019 adults age 21–59 who completed the ACT program in the academic year 2003–04. A total of 8,037 adults were identified in the database (71% female). These cases were sorted by gender and systematically split into groups for item selection ($n = 4{,}019$) and the development of norms ($n = 4{,}018$).
			Item/Scale Functioning
E	20,000	Grade 8	A sample of grade 8 students who completed the EXPLORE program during the 2001–02 academic year. Every 16th male was selected, up to 10,000, and every 16th female was selected, up to 10,000.
F	20,000	Grade 10	A sample of grade 10 students who completed the PLAN program during the 2001–02 academic year. Every 32nd male was selected, up to 10,000, and every 36th female was selected, up to 10,000.
G	20,000	Grade 12	A sample of grade 12 students who completed the ACT program in April or June of 2002. Because we planned to conduct criterion-related validity analyses on this sample, we selected a subset of cases from which we could identify career-relevant criteria. From these cases we randomly selected 10,000 males and 10,000 females.

Item Selection and Revision

The best 72 UNIACT-R items (12 per scale) were identified based on the item performance and content guidelines in Table 2.1. When more or fewer than 12 acceptable items were available, the following types of items, in priority order, were preferred: (a) items with higher item-to-scale correlations, (b) items that contributed to bringing the pattern of observed scale-to-scale correlations in line with the theory underlying UNIACT, and (c) items that contributed to a heterogeneous mix of activities within a given scale. Because the Level 2 UNIACT-S was developed from Level 1 UNIACT-R items, items deemed unfamiliar or otherwise inappropriate for adults were simply excluded or revised, as needed. The item selection guidelines and priorities led to a final set of 72 items (12 per scale) for Level 1 (based on grade 8–12 data, Samples A–C) and Level 2 (based on adult data, Sample D). All items in both levels of UNIACT-S are a subset of items in the Level 1 UNIACT-R, and 60 of the Level 2 UNIACT-S items are shared in common with Level 2 UNIACT-R. Levels 1 and 2 of UNIACT-S share 60 items in common.

Minor revisions in item content were made by an ACT staff member with 25 years of research and development experience in the field of career assessment. Based on student feedback, one of the 72 Level 1 items was modified to enhance understanding. The intent and meaning of the item was judged to be unchanged. Eight of the 72 Level 2 items were modified, again with the goal of keeping the intent and meaning of items unchanged. Two items were modified to make item content more appropriate for use with adults–for example, deleting superfluous school-related content. Six items were modified to meet the needs of the WorkKeys Fit Assessment. This instrument assesses both interests (via Level 2 UNIACT-S) and work-related values, and is intended for people with a wide range of reading levels. To keep the instrument brief and enhance readability, item content judged to be unnecessary was deleted.

Comparison of Item/Scale Functioning: UNIACT-R and UNIACT-S

All editions of UNIACT are based on Holland's (1997) career typology and are designed to meet the performance guidelines listed in Table 2.1. The following sections summarize evidence on the extent to which UNIACT-S and UNIACT-R measure similar constructs and function in similar ways.

Gender Balance

A feature of all editions of UNIACT is the use of gender-balanced items. Since males and females obtain similar distributions of scores, combined-gender norms can be used. Level of gender balance was compared between UNIACT-S and UNIACT-R to determine if item and scale balance has been maintained across editions. Analyses were conducted using Samples E–G in Table 2.2.

Table 2.3 displays two ways of examining gender balance at the item level. The first section shows the average difference (mean of the absolute differences) between males and females in the percentage of people reporting *like* to an item. Smaller average differences indicate more similar responses and thus greater gender balance. With few exceptions, UNIACT-S produced smaller differences (greater gender balance) than UNIACT-R. This pattern is also evident in the second section, which shows the same data in a different way. Here the numbers of items with a gender difference in *like* responses of 15% or less are shown. (The 15% cutoff served as an item redevelopment guideline, as shown in Table 2.1.) In all grades, UNIACT-S produced a higher percentage of items with an acceptable level of gender balance. For example, for grade 12 UNIACT-R had 81 items meeting this cutoff (81/90 = 90%), while UNIACT-S had 68 items meeting this cutoff (68/72 = 94%). Another way to examine balance is by score distribution overlap. As seen in Table 2.4, the index of distribution overlap was identical and uniformly high across both editions of UNIACT. In sum, while perfect gender balance is unachievable, these results show that both editions of UNIACT display substantial gender balance and that UNIACT-S displays slightly more balance than UNIACT-R.

Table 2.3
Gender Differences in UNIACT Item Responses

Edition and scale	Mean of absolute difference between males and females in the percentage of *like* responses			Number of items with a gender difference of 15% or less in the percentage of *like* responses		
	Grade 8	Grade 10	Grade 12	Grade 8	Grade 10	Grade 12
UNIACT-R						
Science & Technology	4.6	4.3	4.9	15	15	15
Arts	9.8	8.8	7.5	11	12	14
Social Service	15.1	15.4	8.1	9	8	13
Administration & Sales	5.1	4.2	3.1	15	15	15
Business Operations	3.3	3.2	3.5	15	15	15
Technical	9.3	9.8	12.0	11	12	9
Sum	47.2	45.7	39.1	76	77	81
UNIACT-S						
Science & Technology	4.5	4.4	4.0	12	12	12
Arts	9.0	7.6	6.2	9	10	12
Social Service	12.4	12.8	6.4	9	8	12
Administration & Sales	5.9	4.5	2.7	12	12	12
Business Operations	3.2	2.9	3.2	12	12	12
Technical	8.4	8.7	11.0	9	10	8
Sum	43.4	40.9	33.5	63	64	68

Table 2.4
Male-Female Score Overlap for UNIACT Scales

	Grade 8					Grade 10					Grade 12				
Edition and scale	Males		Females		O[a]	Males		Females		O[a]	Males		Females		O[a]
UNIACT-R	**Mean**	**SD**	**Mean**	**SD**		**Mean**	**SD**	**Mean**	**SD**		**Mean**	**SD**	**Mean**	**SD**	
Science & Technology	27.34	8.38	26.75	8.27	97	26.88	8.59	26.22	8.50	97	28.80	8.53	27.51	8.63	94
Arts	29.61	7.06	31.50	7.06	89	29.00	7.42	30.39	7.43	93	30.42	7.59	29.87	7.64	97
Social Service	31.64	7.34	35.30	6.38	79	32.08	7.46	35.59	6.31	80	35.45	6.81	36.71	6.15	92
Administration & Sales	27.08	7.04	28.61	7.20	91	27.81	7.36	28.60	7.26	96	30.52	7.26	30.07	7.51	98
Business Operations	24.34	6.90	24.69	7.07	98	24.10	7.15	23.93	7.39	99	27.26	7.80	27.04	8.25	99
Technical	26.50	6.97	23.89	6.46	85	25.95	7.09	22.58	6.36	80	28.24	7.48	24.21	7.14	78
Median					90					94					96
UNIACT-S															
Science & Technology	22.61	7.02	21.83	6.86	96	22.28	7.24	21.58	7.10	96	23.79	7.03	22.62	7.13	93
Arts	23.84	5.83	25.46	5.89	89	23.22	6.09	24.47	6.25	92	24.33	6.24	24.02	6.38	98
Social Service	25.29	5.83	27.72	5.30	83	25.62	5.94	27.96	5.25	83	28.23	5.47	28.89	5.13	95
Administration & Sales	21.50	5.87	22.88	5.99	91	22.30	6.18	23.02	6.10	95	24.51	6.08	24.32	6.24	99
Business Operations	19.65	5.63	19.76	5.76	99	19.43	5.85	19.07	6.03	98	21.88	6.50	21.47	6.72	98
Technical	20.79	5.66	19.04	5.34	87	20.37	5.75	18.04	5.24	83	22.30	6.09	19.39	5.81	81
Median					90					94					96

Note.[a] Percent overlap is based on Tilton's (1937) measure of overlap.

Scale Intercorrelations

UNIACT scales were designed to parallel Holland's (1997) six career types, thus we would expect to see relationships among the six UNIACT scales that are consistent with this theory. In addition, if these relationships are comparable across UNIACT-S and UNIACT-R, this would suggest that the two editions are measuring similar constructs. Table 2.5 shows scale intercorrelations for UNIACT-S and UNIACT-R based on data from Samples E–G (described in Table 2.2). The patterns of correlations are generally in line with Holland's theory, and are very similar across editions. For example, correlations between the Administration & Sales scale and adjacent scales exceed correlations between the Administration & Sales scale and nonadjacent scales. This pattern is observed for both editions of UNIACT and across all grade levels. A few discrepancies from theory are also observed, for example, at all grade levels the Science & Technology scale displays a higher correlation with the Social Service scale than with the adjacent Arts scale. Careful examination reveals that UNIACT-S correlations are often slightly lower than corresponding UNIACT-R correlations, as one would expect given the reduced scale length of UNIACT-S. On the whole, these patterns approximate those found for nationally representative samples of high school students in the U.S. (ACT, 1995, 2001). Additional evidence of construct validity is described in Chapter 4, including evidence that the Data/Ideas and People/Things Work Task Dimensions underlie both UNIACT-S and UNIACT-R.

Table 2.5
Scale Intercorrelations: UNIACT-R and UNIACT-S

Edition and scale	ST	AR	SS	AS	BO	TE
			Grade 8			
Science & Technology (ST)	–	32	38	27	33	45
Arts (AR)	27	–	47	38	27	42
Social Service (SS)	37	46	–	65	46	39
Administration & Sales (AS)	26	31	62	–	63	32
Business Operations (BO)	32	25	47	61	–	50
Technical (TE)	37	36	41	25	48	–
			Grade 10			
Science & Technology (ST)	–	30	34	23	24	40
Arts (AR)	25	–	41	31	15	36
Social Service (SS)	34	41	–	62	38	32
Administration & Sales (AS)	22	26	60	–	59	27
Business Operations (BO)	23	13	38	57	–	44
Technical (TE)	33	31	34	19	43	–
			Grade 12			
Science & Technology (ST)	–	38	38	27	26	49
Arts (AR)	33	–	43	37	20	47
Social Service (SS)	38	45	–	63	40	38
Administration & Sales (AS)	25	31	61	–	64	33
Business Operations (BO)	25	19	40	62	–	46
Technical (TE)	41	41	40	25	44	–

Note. Correlations for total sample (males and females combined). Decimal points have been omitted from correlations. UNIACT-R intercorrelations are above the diagonal; UNIACT-S intercorrelations are below the diagonal.

Reliability

Internal consistency reliability (coefficient alpha) is affected by scale length, so it is not surprising that the 15-item UNIACT-R scales generally display slightly higher alphas than the 12-item UNIACT-S scales (Table 2.6). Using the grade 10 sample (Sample F in Table 2.2) as an example, the median alpha across the six scales was .86 (.84–.91) for UNIACT-S and .88 (.87–.92) for UNIACT-R. Also as expected, reliabilities increased slightly with the age of the sample. Median alphas for UNIACT-S increased from .84 for grade 8 to .87 for grade 12. Across all three grade levels, alphas for UNIACT-S ranged from .82 to .91, comparing favorably to reliabilities reported for non-ACT career inventories of similar length (e.g., see Holland, Fritzsche, & Powell, 1997, p. 22). Additional evidence of UNIACT reliability is reported in Chapter 6 of this manual.

Summary

A 72-item edition of UNIACT, called UNIACT-S, was developed using item performance and content guidelines identical to those used in the prior development of UNIACT-R. UNIACT-S scales display levels of gender balance that meet or exceed that of UNIACT-R, and display internal structure (patterns of scale intercorrelations) and reliability comparable to that of UNIACT-R.

Table 2.6
Internal Consistency Reliability

	Grade 8			Grade 10			Grade 12		
Edition and scale	Total	Male	Female	Total	Male	Female	Total	Male	Female
UNIACT-R									
Science & Technology	91	91	90	92	92	92	92	92	92
Arts	84	84	84	87	87	87	88	88	88
Social Service	87	88	84	88	89	85	87	88	86
Administration & Sales	86	86	85	87	88	87	88	88	89
Business Operations	87	88	87	90	90	90	92	92	92
Technical	85	85	84	87	87	86	89	89	89
Median	86	87	84	88	88	87	88	88	89
UNIACT-S									
Science & Technology	89	90	89	91	92	91	91	91	91
Arts	82	82	82	84	85	84	86	86	86
Social Service	83	84	81	84	86	81	84	85	83
Administration & Sales	84	84	84	86	87	85	87	87	87
Business Operations	85	85	85	88	88	88	90	90	90
Technical	83	83	82	85	85	84	87	87	87
Median	84	84	83	86	86	84	87	87	87

Note. Coefficient alpha (Cronbach, 1951) used as index of internal consistency.

3
Norms

This chapter describes the norms development process for UNIACT-S and UNIACT-R, and provides national statistics with which to evaluate the representativeness of these norms. There are four grade/age sets of norms: grades 8, 10, 12, and college/adult. As summarized in Chapter 1, UNIACT is currently a component of several ACT programs. In each program, UNIACT norms are appropriate for the age range the program was designed to serve. For example, grade 12 norms are used in the ACT and in PLAN for students in grades 11 or 12. Each program's technical materials provide information on the specific UNIACT norms used in that program.

Each set of norms is based on samples obtained from ACT program files: grade 8 norms were generated from EXPLORE, grade 10 norms were generated from PLAN, and grade 12 norms were generated from the ACT. Although these three programs test a sizeable percentage of U.S. high school students (approximately 23%), some sample bias is inevitable. To improve the national representativeness of the high school samples, individual records were weighted to more closely match the characteristics of the target populations with respect to gender, ethnicity, school enrollment, school affiliation (public/private), and region of the country. College/adult norms were generated using adults (people age 21 or older) who had completed ACT testing. To improve the national representativeness of the college/adult sample, individual records were weighted to more closely match the characteristics of the target population with respect to gender, ethnicity, age, and region of the country.

Norming Samples

Grade 8

Development of the grade 8 norming sample began with eighth graders from schools that participated in EXPLORE testing during the 2003–2004 academic year. Selection of schools involved two steps. First, using Market Data Retrieval (MDR; 2003) data, we retained U.S. schools with public, private, Catholic, or Bureau of Indian Affairs affiliation. Second, we retained schools that contained an eighth grade and had at least ten EXPLORE-tested students during the 2003–2004 academic year. Within each of the selected schools, we retained those students who reported a valid career choice and had a complete set of valid interest inventory responses. The final sample consisted of 273,964 students from 2,739 schools. In general, schools that use EXPLORE test all grade 8 students. The median proportion of grade 8 students tested was 0.81 for this sample.

Grade 10

Development of the grade 10 norming sample began with tenth graders from schools that participated in PLAN testing during the 2003–2004 academic year. Selection of schools involved two steps. First, based on MDR (2003) data, we retained U.S. schools with public, private, Catholic, or Bureau of Indian Affairs affiliation. Second, we retained schools that contained a tenth grade and had at least ten PLAN-tested students during the 2003–2004 academic year. Within each of the selected schools, we retained those students who reported a valid career choice and had a complete set of valid interest inventory responses. The final sample consisted of 407,325 students from 4,030 schools. The median proportion of grade 10 students tested was 0.78 for this sample.

Grade 12

Development of the grade 12 norming sample began with twelfth graders who completed the ACT during the 2003–2004 academic year. Selection of schools involved two steps. First, based on MDR (2003) data, we retained schools in the United States with public, private, Catholic, or Bureau of Indian Affairs affiliation. Second, we retained schools that contained a twelfth grade and had at least ten ACT-tested students during the 2003–2004 academic year. Within each of the selected schools, we retained those students who reported a valid career choice and had a complete set of valid interest inventory responses. In addition, we only retained those students who had completed the ACT during their grade 12 academic year. The final sample consisted of 257,567 students from 8,555 schools.

College/Adult

Development of the college/adult norming sample began with adults (people age 21 or older) who completed the ACT during the 2003–04 academic year. A total of 8,037 people were identified. This sample was sorted by gender and systematically split (via every other case) into two groups of 4,019 and 4,018 adults. Norms were generated on the group of 4,018 adults. The mean age of this group was 29. Ages ranged from 21 to 59, with 65% in the 21–30 age range, and 35% over age 30.

Weighting

To improve the national representativeness of the samples, individual records were weighted to more closely match the characteristics of the national target populations. For grades 8–12 this involved weighting records with respect to gender, ethnicity, school enrollment, school affiliation (public/private), and region of the country.

Grades 8 and 10

The two samples were weighted to make them more representative of the target populations of eighth graders and tenth graders in the U.S., respectively. The proportions of eighth graders and tenth graders in the U.S. in each gender/ethnicity category were approximated using population counts from the 2000 Census (2001). The 10–14 age group was used for grade 8, and the 15–19 age group was used for grade 10. The proportions of U.S. eighth graders and tenth graders in each enrollment size/affiliation/region category were calculated using MDR (2003) data. Within each sample (grade 8 or grade 10), each student was assigned a weight as WGT = $(N1/n1)*(N2/n2)$ where $N1$ = the number of students, in the population, from the gender/ethnicity category to which the student belongs; $n1$ = the number of students, in the sample, from the gender/ethnicity category to which the student belongs; $N2$ = the number of students, in the population, from the enrollment size/affiliation/region category to which the student belongs; and $n2$ = the number of students, in the sample, from the enrollment size/affiliation/region category to which the student belongs.

Grade 12

The proportion of twelfth graders in the U.S. in each gender/ethnicity category was approximated using population counts for the 15–19 age group from the 2000 Census (2001). The proportion of U.S. twelfth graders in each enrollment size/affiliation/region category was calculated using MDR (2003) data.

Because ACT-tested students are typically college-bound, we expect them to have higher educational plans than the general population of twelfth graders. For this reason, we also weighted the grade 12 sample with respect to educational plans to make it more representative of the target population. During ACT registration students are asked to choose, from six categories, the highest level of education they expect to complete. To estimate the relative frequency of each educational plan category in the target population, we used ACT-tested eleventh graders in Illinois and Colorado from the 2003–2004 academic year. Because eleventh graders are census-tested in these two states, these data are not subject to self-selection bias.

Each student was assigned a weight as WGT = $(N1/n1)*(N2/n2)*(N3/n3)$ where $N1$ = the number of students, in the population, from the gender/ethnicity category to which the student belongs; $n1$ = the number of students, in the sample, from the gender/ethnicity category to which the student belongs; $N2$ = the number of students, in the population, from the enrollment size/affiliation/region category to which the student belongs; $n2$ = the number of students, in the sample, from the enrollment size/affiliation/region category to which the student belongs; $N3$ = the number of students, among eleventh graders in Illinois and Colorado in 2003–2004, from the education plan category to which the student belongs; and $n3$ = the number of students, in the sample, from the educational plan category to which the student belongs.

College/Adult

The sample was weighted to make it more representative of the national population of adults aged 21 to 59. Using data from the 2000 Census (2001), we obtained the proportion of adults aged 21 to 59 by gender, racial/ethnic group, age category, and geographic region. Using our sample of 4,018 adults, we obtained the sample proportions for combinations of these same variables.

Each adult was assigned a weight as WGT = N/n where N = the number of adults, in the population, from the gender/race/age/region category to which the adult belongs, and n = the number of adults, in the sample, from the gender/race/age/region category to which the adult belongs. For some adults in the sample, race/ethnicity was unknown. For these cases, we assigned a weight equal to the mean weight corresponding to the adult's gender/age/region category. In other cases, the assigned weight for a category was extreme because of large disparities in the population and sample's proportions for that category. To avoid assigning extreme weights that might unduly influence the norms, we set a maximum and minimum allowable weight.

Precision

Grades 8, 10, and 12

The norming samples were quite large, permitting very precise estimation of percentile ranks. For a simple random sample of 16,587 student scores, there would be a 99% chance that the 50th percentile of the scores in the sample was within one percentile rank of the 50th percentile of the scores in the target population. Although our samples were not simple random samples, each sample contained more than 250,000 students.

College/Adult

For a simple random sample of 2,400 adults, there would be a 95% chance that the 50th percentile of the scores in the sample was within two percentile ranks of the 50th percentile of the scores in the target population. Although our sample was not a simple random sample, it contained more than 4,000 adults, permitting precise estimation of percentiles.

Representativeness of Norms

One way to determine the type and extent of sample bias is to compare demographic characteristics of the norming samples with national statistics for various educational and demographic variables. Tables 3.1–3.4 compare demographic characteristics of the norming samples to national statistics, permitting a general examination of the representativeness of the norming samples. The sample weights described above were used to obtain the weighted sample proportions. As can be seen, the norming samples appear to be reasonably representative of their respective national populations. For example, the grade 10 weighted sample is very similar to the national population with respect to geographic region–within a percentage point in each region.

Norm Distributions

As discussed in Chapter 1, UNIACT uses combined-sex norms. Norm distributions for each grade level for both UNIACT-S and UNIACT-R are shown in Appendix D1–7. Entries in these tables are cumulative percentages, defined as the percentage of scores falling at or below a given raw score value (i.e., through the upper limit of the raw score interval). For the grade 12 tables, the raw scores are also converted to *T* scores (mean of 50 and a standard deviation of 10) based on the normal curve. Because the *T* scores were derived through an area transformation, they correspond to approximately the same cumulative percent across all scales. Hence, a *T* score of 60 has a cumulative percent of approximately 84 for all scales.

As noted in Chapter 1, UNIACT is a component of several ACT programs. Administration methods in these programs vary, from traditional paper-based administration of items, to Web-based administration of items with or without additional multimedia content. The norms in Appendix D1–7 are used regardless of administration mode. Research on the measurement properties of UNIACT indicates that scores are comparable regardless of administration mode, making it unnecessary to develop different sets of norms for each mode (Staples & Luzzo, 1999).

Table 3.1
Selected Characteristics of Grade 8 Norm Group Students and Schools

Characteristic	Weighted sample proportion	U.S. proportion[a]
Gender		
Female	.48	.49
Male	.52	.51
Race/Ethnicity		
African American/Black	.11	.13
American Indian, Alaska Native	.01	.01
Asian American, Pacific Islander	.04	.03[c]
Caucasian American/White	.56	.60[d]
Hispanic[b]	.14	.13[e]
Other, Prefer Not to Respond, Blank	.12	[f]
Multiracial	.03	.03[g]
Estimated Enrollment		
<126	.25	.25
126–254	.24	.25
255–370	.25	.25
>370	.26	.25
School Affiliation		
Public	.90	.90
Private	.10	.10
Geographic Region		
East	.40	.42
Midwest	.21	.21
Southwest	.13	.13
West	.26	.24

Note. [a] U.S. proportion for gender and ethnicity estimated from the 2000 Census (2001) age 10–14 group. U.S. proportions for enrollment and region obtained from the MDR (2003) database. [b] Combination of two racial/ethnic categories: "Mexican American/Chicano" and "Puerto Rican, Cuban, Other Hispanic Origin." [c] U.S. Census category "Asian/Native Hawaiian/Other Pacific Islander." [d] U.S. Census category "White." [e] U.S. Census category "Hispanic/Latino Ethnicity." [f] U.S. Census proportion not available. [g] U.S. Census category "Two or more races."

Table 3.2
Selected Characteristics of Grade 10 Norm Group Students and Schools

Characteristic	Weighted sample proportion	U.S. proportion[a]
Gender		
Female	.48	.48
Male	.52	.52
Race/Ethnicity		
African American/Black	.13	.13
American Indian, Alaska Native	.01	.01
Asian American, Pacific Islander	.03	.03[c]
Caucasian American/White	.57	.61[d]
Hispanic[b]	.12	.13[e]
Other, Prefer Not to Respond, Blank	.12	[f]
Multiracial	.02	.03[g]
Estimated Enrollment		
<170	.24	.25
170–336	.25	.25
337–505	.25	.25
>505	.26	.25
School Affiliation		
Public	.92	.92
Private	.08	.08
Geographic Region		
East	.41	.42
Midwest	.21	.22
Southwest	.13	.12
West	.25	.24

Note. [a] U.S. proportion for gender and ethnicity estimated from the 2000 Census (2001) age 15–19 group. U.S. proportions for enrollment and region obtained from the MDR (2003) database. [b] Combination of two racial/ethnic categories: "Mexican American/Chicano" and "Puerto Rican, Cuban, Other Hispanic Origin." [c] U.S. Census category "Asian/Native Hawaiian/Other Pacific Islander." [d] U.S. Census category "White." [e] U.S. Census category "Hispanic/Latino Ethnicity." [f] U.S. Census proportion not available. [g] U.S. Census category "Two or more races."

Table 3.3
Selected Characteristics of Grade 12 Norm Group Students and Schools

Characteristic	Weighted sample proportion	U.S. proportion[a]
Gender		
Female	.50	.48
Male	.50	.52
Race/Ethnicity		
African American/Black	.12	.13
American Indian, Alaska Native	.01	.01
Asian American, Pacific Islander	.03	.03[c]
Caucasian American/White	.58	.61[d]
Hispanic[b]	.13	.13[e]
Other, Prefer Not to Respond, Blank	.10	[f]
Multiracial	.03	.03[g]
Estimated Enrollment		
<171	.26	.25
171–334	.24	.25
335–501	.24	.25
>501	.26	.25
School Affiliation		
Public	.92	.92
Private	.08	.08
Geographic Region		
East	.39	.42
Midwest	.22	.22
Southwest	.13	.12
West	.26	.24

Note. [a] U.S. proportion for gender and ethnicity estimated from the 2000 Census (2001) age 15–19 group. U.S. proportions for enrollment and region obtained from the MDR (2003) database. [b] Combination of two racial/ethnic categories: "Mexican American/Chicano" and "Puerto Rican, Cuban, Other Hispanic Origin." [c] U.S. Census category "Asian/Native Hawaiian/Other Pacific Islander." [d] U.S. Census category "White." [e] U.S. Census category "Hispanic/Latino Ethnicity." [f] U.S. Census proportion not available. [g] U.S. Census category "Two or more races."

Table 3.4
Selected Characteristics of Adult Norm Group

Characteristic	Weighted sample proportion	U.S. proportion[a]
Gender		
Female	.54	.50
Male	.46	.50
Race/Ethnicity		
African American/Black	.12	.12
American Indian, Alaska Native	.01	.01
Asian American, Pacific Islander	.03	.04[c]
Caucasian American/White	.67	.70[d]
Hispanic[b]	.10	.12[e]
Other, Prefer Not to Respond, Blank	.07	[f]
Multiracial	.01	.01[g]
Age		
21–29	.30	.23
30–39	.33	.29
40–49	.27	.28
50–59	.10	.21
Region		
East	.35	.38
Midwest	.27	.24
Southwest	.19	.16
West	.18	.23

Note. [a] U.S. proportion for individuals age 21–59 group according to the 2000 Census (2001). State Population Estimates by Demographic Characteristics with 6 Race Groups: April 1, 2000, to July 1, 2005. Source: Population Estimates Program, U.S. Bureau of the Census. Release Date: August 4, 2006. [b] Combination of two racial/ethnic categories: "Mexican American/Chicano" and "Puerto Rican, Cuban, Other Hispanic Origin." [c] U.S. Census category "Asian/Native Hawaiian/Other Pacific Islander." [d] U.S. Census category "White." [e] U.S. Census category "Hispanic/Latino Ethnicity." [f] U.S. Census proportion not available. [g] U.S. Census category "Two or more races."

4
Theory-Based Evidence of Validity

This chapter summarizes evidence that UNIACT scales function in ways that are consistent with the theory on which they are based. Because the same theory underlies both the inventory and ACT's occupational classification system, evidence of theory-relevant validity also provides support for the meaningful connections between scores and occupations, and thus is support for the inventory's use in career exploration and counseling. Evidence is summarized for UNIACT-R and UNIACT-S, as both are currently used in ACT programs. As discussed in Chapter 2, UNIACT-S items are a subset of UNIACT-R items and display very similar patterns of scale intercorrelations. Thus, validity evidence for UNIACT-R is highly relevant to UNIACT-S, and vice versa.

Scale Structure

As noted in Chapter 1, all editions of UNIACT report scores for six basic types of vocational interests paralleling the six occupational and interest types in Holland's (1997) theory of careers. The types are not independent. As shown in Figure 1.1, Holland represents the theoretical relationships among the six interests by the use of a hexagon. According to the theory, the relationships between the types vary systematically according to their proximity on the hexagon. Interests adjacent on the hexagon resemble each other most, interests separated by one type resemble each other less, and interests on opposite sides of the hexagon resemble each other least. Scales purported to measure Holland types should show relationships that converge and diverge in ways that approximate this theorized structure.

Over the years, research on the structure of UNIACT scales has consistently supported this hexagonal structure–across editions, gender, and U.S. racial/ethnic groups (e.g., Day, Rounds, & Swaney, 1998; Prediger, 1982; Tracey & Robbins, 2005). Empirical support for the structural validity of other Holland-type interest measures has also been reported, but varies by instrument (e.g., Rounds, Davison, & Dawis, 1979; Rounds & Day, 1999). Research examining the structure of Holland-type interest scores has occasionally been hampered by conceptual and methodological issues. Although the hexagon is generally understood to be approximate (Chartrand, 1992; Fouad, Harmon, & Borgen, 1997; Holland, Powell, & Fritzsche, 1997; Prediger, 2000), some researchers have evaluated structure against a perfect equilateral hexagon. Results of such studies have not been surprising: empirical structure falls short of the idealized standard (e.g., Darcy & Tracey, 2007). In contrast, most research on UNIACT structure has presumed that the hexagon is a useful approximation of reality. This assumption aligns well with the purpose of UNIACT. Designed as a wideband measure (Cronbach & Gleser, 1965), UNIACT is intended to facilitate career exploration through the accumulation of information and experience, and was never intended to be used to seek exactness (ACT, 1994, 1995).

Perhaps the most common way to evaluate structural relationships among Holland-type scales is to examine scale intercorrelations. As shown in Chapter 2 (Table 2.5), the patterns of UNIACT scale intercorrelations are generally in accord with Holland's theory, and are comparable across editions. For example, examination of UNIACT-S correlations for grade 12 reveals that the correlations between the Business Operations scale and adjacent scales are .62 and .44, while the correlation with the Arts scale–on the opposite side of the hexagon–is .19. Intermediate levels of correlation are reported for the other scales, as would be expected given their locations on the hexagon.

Rather than trying to discern a grand structure from numerous intercorrelations, many investigators use multivariate approaches to evaluate the structural characteristics of Holland-type scales. Table 4.1 lists many of the studies that have used multivariate approaches to evaluate the structural validity of UNIACT. These data represent more than 215,000 people and include grade 6 students, high school students across diverse racial/ethnic groups (grades 8, 10, and 12), and adults in both the U.S. and Japan. All of the studies in Table 4.1 have found UNIACT scale structure to be in accord with Holland's theory.

Table 4.1
Studies Showing UNIACT Scale Structure in Line with Holland's Model

Authors	Samples
Prediger, 1982	National sample of eleventh graders ($n = 1{,}851$) and a college-bound sample of twelfth graders ($n = 2{,}940$). Both samples completed UNIACT-A.
ACT, 1995	Nationally representative samples of eighth graders ($n = 4{,}631$), tenth graders ($n = 4{,}133$), and twelfth graders ($n = 4{,}666$). Adults from 8 states age 25 or older enrolled in college ($n = 200$). All samples completed UNIACT-R.
Day, Rounds, & Swaney, 1998	College-bound samples of twelfth graders who identified their racial/ethnic group as African American ($n = 2{,}745$), Asian American ($n = 1{,}959$), Native American ($n = 2{,}643$), Euro-American ($n = 2{,}454$), and Mexican American ($n = 1{,}809$). All samples completed UNIACT-R.
ACT, 2001	Nationally representative samples of grade 8 and grade 10 students. Both samples completed UNIACT-R.
Swaney & Flojo, 2001	A sample of sixth graders from 15 states nationwide ($n = 1{,}732$). The sample completed a version of UNIACT-R designed for grades 6–7.
Swaney & Bobek, 2002	A sample of employed adults in Japan ($n = 928$). The sample completed a version of UNIACT-R developed for use in Japan.
Swaney, 2003	National samples of eighth graders ($n = 20{,}000$), tenth graders ($n = 20{,}000$), and college-bound twelfth graders $n = 20{,}000$). Structure was examined for both UNIACT-R and UNIACT-S.
Prediger & Swaney, 2004	Samples of twelfth graders ($n = 207$) and adults ($n = 184$). Both samples completed UNIACT-R.
Tracey & Robbins, 2005	Seven samples of high school students (in grades 8, 10, and 12) who identified their racial/ethnic group as African American ($n = 1{,}000$), Asian American ($n = 1{,}000$), Multiracial American ($n = 1{,}000$), Native American ($n = 999$), Euro-American ($n = 999$), Mexican American ($n = 1{,}000$), and other Latino ($n = 688$). Samples were drawn from ACT files. All samples completed UNIACT-R.
Gupta, Tracey, & Gore, 2008	Five samples of census-tested eleventh graders in Illinois and Colorado. Students identified their racial/ethnic group as African American ($n = 11{,}865$), Asian American ($n = 5{,}147$), Native American ($n = 982$), Euro-American ($n = 83{,}489$), and Latino ($n = 14{,}084$). All samples completed UNIACT-R.

Scale Structure and Underlying Dimensions

If ACT Interest Inventory scales are measuring their intended constructs, we should expect to see a particular pattern of relationships among them, and analyses that *visually* depict the relationships among the scales should reveal an approximately hexagonal shape–similar to that shown in Figure 1.1. As summarized below, there have been numerous replications of UNIACT scale validity using a targeted principal components procedure that permits visual examination of scale structure relative to the dimensions underlying Holland's six types.

Cooley and Lohnes (1971, pp. 137–143) describe a procedure for extracting predefined orthogonal factors from a set of intercorrelations. (As used here, *factors* refer to principal components.) No factor rotations are involved. This targeted principal components procedure can be used to extract the Data/Ideas and People/Things Work Task Dimensions that underlie Holland's (1997) six types. As noted in Chapter 1, empirical support for these two orthogonal dimensions has been provided by Prediger (1982) and others (e.g., Rounds, 1995; Prediger, 1996; Prediger & Swaney, 2004). The Cartesian coordinates of the six Holland types can be used to specify the relative sizes of the correlations expected between the types and the dimensions (Prediger & Vansickle, 1992). In effect, values for the theory-based coordinate points are used to define two dimensions (factors) that can be verified empirically.

If the Data/Ideas and People/Things Work Task Dimensions fit the data perfectly, they should account for the maximum amount of variance that can be accounted for by any two interest dimensions. To be useful, they should also account for a substantial portion of total variance. A nontargeted principal components analysis provides the benchmark data. Further, as explained in the following section, it is essential that interest dimensions not be confounded by response style variance. Therefore, response style variance was removed from both the targeted and nontargeted analyses.

Loadings (correlations) for the data/ideas and people/things factors are presented in Table 4.2 for Samples E, F, and G (described in Table 2.2). For all three samples, the total percentage of variance accounted for by the dimensions after variance associated with response style (described below) was removed was identical, or nearly identical, for both the targeted and nontargeted-principal-components analyses. For example, the total percentages of non-response-style variance accounted for by the targeted and nontargeted analyses for the UNIACT-S grade 12 sample were both 57%.

Data/ideas and people/things factor loadings for all three grades, by gender and UNIACT edition, are plotted in Figure 4.1. The correspondence between the scale locations shown in these figures and Holland's (1997) hexagonal model (Figure 1.1) are readily apparent. (For the reader's convenience, plotted loadings for adjacent scales are connected by straight lines.) Although minor differences in the shapes of the configurations can be noted across these various groups, more evident is the degree of similarity across the plots. Factor loadings for males and females are quite similar, suggesting the same basic interest structure for males and females. These results support the structural validity of the scales and the generalizability of the Data/Ideas and People/Things Work Task Dimensions.

Similar results for other samples, based on UNIACT-R, have been found using targeted principal components analysis. For example, ACT (2001) described very similar results for four samples of students in grades 8 and 10, and ACT (1995) reported very similar results for 18 samples ranging from grade 8 to adult. Evidence of structural validity has also been reported for five different U.S. racial/ethnic groups (e.g., Day et al., 1998) and a sample of adult workers in Japan (Swaney & Bobek, 2002). Additional studies reporting UNIACT scale intercorrelations consistent with Holland's theory are listed in Table 4.1.

Response Style and Scale Structure

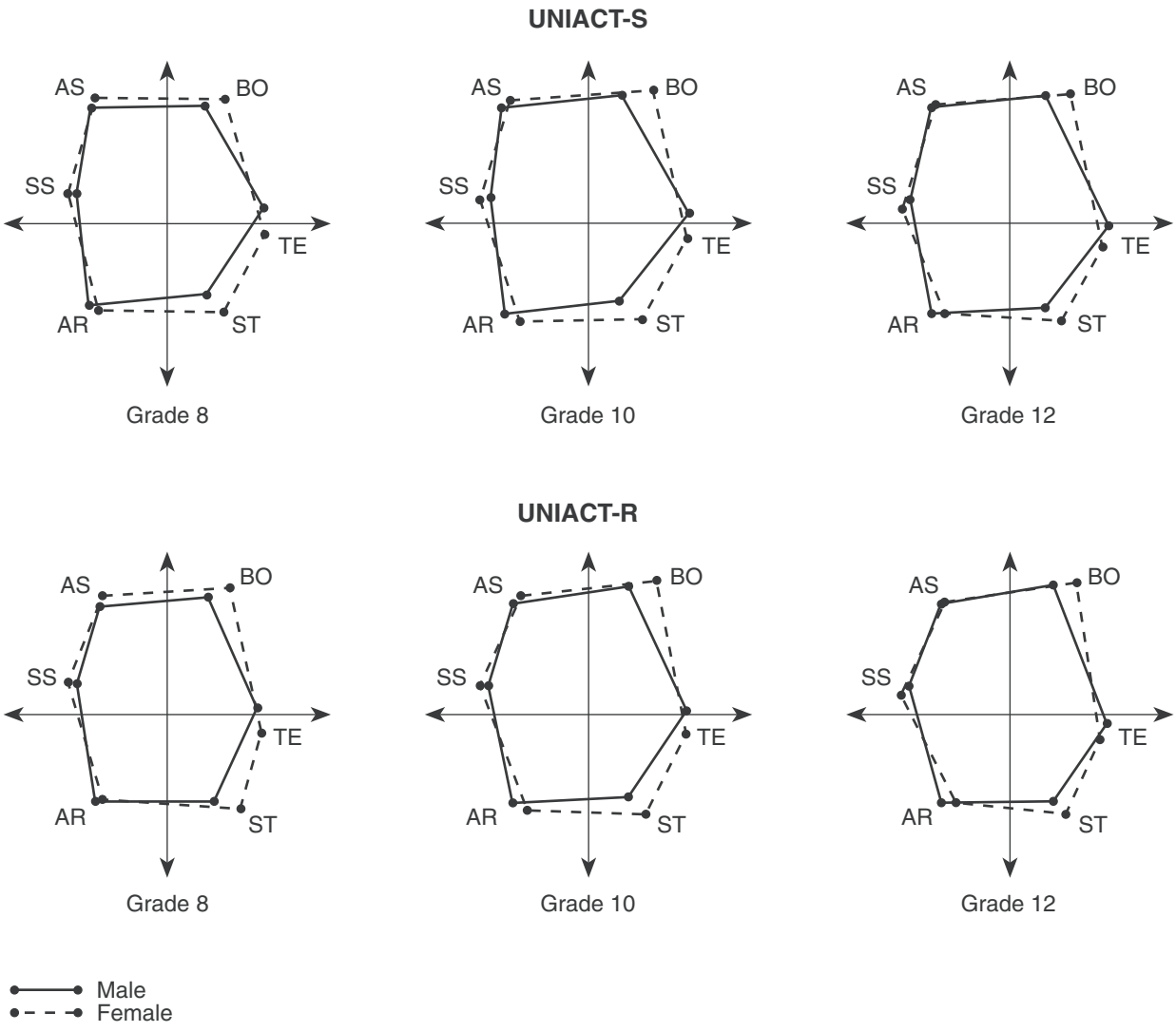
Not shown in Table 4.2 is a general factor common to interest inventories using response categories such as *like*, *indifferent*, and *dislike*. When these categories are used, the frequency with which a particular response is chosen tends to vary from person to person, regardless of item content. That is, some people tend to choose *like* more often than others, some choose *indifferent* more often, etc. If the categories are scored in the same way (e.g., 2, 1, 0) for each item, scores on the interest scales will be affected by the person's response style–sometimes called "acquiescent style" (Holland, 1985, p. 5) or "response bias" (Kuder, 1977, p. 18). It is important to avoid the confounding effects of response style in studies of interest dimensions.

Table 4.2
UNIACT Scale Loadings on Data/Ideas and People/Things Dimensions

	UNIACT-S				UNIACT-R			
	Male		Female		Male		Female	
Interest scales	D/I	P/T	D/I	P/T	D/I	P/T	D/I	P/T
				Grade 8				
Science & Technology	–33	18	–41	26	–35	22	–43	29
Arts	–37	–36	–40	–32	–35	–33	–39	–30
Social Service	14	–42	14	–46	14	–42	15	–46
Administration & Sales	53	–35	58	–33	50	–31	55	–30
Business Operations	54	17	57	27	54	19	58	29
Technical	07	44	–05	45	03	42	–08	43
				Grade 10				
Science & Technology	–36	14	–44	25	–38	18	–46	27
Arts	–42	–38	–45	–32	–41	–35	–44	–28
Social Service	12	–45	11	–50	13	–46	13	–50
Administration & Sales	53	–40	57	–36	51	–35	55	–33
Business Operations	59	16	62	30	59	18	62	32
Technical	05	47	–07	46	02	45	–09	45
				Grade 12				
Science & Technology	–39	17	–45	24	–40	20	–46	26
Arts	–42	–36	–42	–30	–41	–32	–41	–25
Social Service	11	–46	07	–49	13	–47	09	–50
Administration & Sales	53	–36	55	–34	51	–32	52	–30
Business Operations	59	17	60	28	60	20	61	31
Technical	–01	46	–11	43	–04	45	–12	42

Figure 4.1

Plots of UNIACT theory-based loadings for national samples of students in grades 8, 10, and 12.



Note. Plots are based on data in Table 4.2.

Prediger (1982) provides data regarding the extent to which response style affects scores on various interest measures. These data, based on 24 intercorrelation matrices for instruments assessing Holland's types, show that the response style factor often accounts for 40% or more of the total variance. In factor analyses, the chief identifying feature of a response style factor is that, in the initial factor matrix, all interest scales have relatively high loadings on it. Often these loadings are all higher than +.60. When investigators examine Holland-type scale structure using inventories with a sizable response style presence, deviations from hypothesized structure may be due to low validity, the impact of unremoved response style, or both. Thus some published reports of weak Holland-type structure may be explained by the failure to account for response style.

A response style factor was obtained in the analyses of the sets of scale intercorrelations for Samples E, F, and G. After the targeted principal components procedure extracted the uncorrelated factors, the largest remaining factor in the UNIACT-S data (i.e., the response style factor) accounted for 48% of the total variance for eighth graders, 44% for tenth graders, and 48% for twelfth graders. Scale loadings for this factor ranged, for example, from .66 to .74 for the grade 12 sample. In the benchmark principal components analyses, the response style factor was the first to emerge. This factor accounted for 49% of the total variance for eighth graders, 45% for tenth graders, and 49% for twelfth graders. As is evident, it was important that we removed response style from our examination of scale structure.

Age-Related Structural Stability

Two studies have examined the structure of UNIACT scales over time. Swaney and Flojo (2001) used the targeted principal components analysis procedure described above to compare UNIACT scale structure for five samples: grade 6 students from 15 schools nationwide, nationally representative samples of grade 8, grade 10, and grade 12 students, and a group of adults age 25 or older enrolled in 8 colleges nationwide. For all five age groups, plotted factor loadings corresponded to Holland's (1997) hexagonal model. Interestingly, variance associated with the data/ideas and people/things dimensions was lowest for the grade 6 group, and systematically increased for grades 8, 10, 12, and adults. These age-related changes were apparent in the plotted factor loadings–the configurations retained their hexagonal shape but systematically increased with age (e.g., see Prediger & Swaney, 1995, p. 448). Variance associated with a general factor (response style) decreased with age, suggesting that younger people are somewhat more likely to respond to interest items in ways that are independent of item content.

Using data from ACT files, Tracey and Robbins (2005) examined the structure of UNIACT-R scales for 14 samples: seven racial/ethnic groups by gender. Each student completed UNIACT three times, as part of EXPLORE (in grade 8), PLAN (in grade 10), and the ACT (in grade 12), thus structure could be tested under a total of 42 conditions. These investigators used the randomized test of hypothesized order relations (Tracey, 1997) to examine whether UNIACT scale relationships followed a RIASEC order. All 42 indices of RIASEC order were statistically significant, indicating fit to RIASEC across racial/ethnic group, gender, and time. Taken together, these two studies suggest that UNIACT structure is consistent with Holland's theory and does not vary across a wide age span (from grade 6 to adulthood). The variance associated with interests increases with age.

Item Structure

All of the studies in Table 4.1 examined the structure of UNIACT *scales*. A related question is the structure of UNIACT *items*. Do the items represent the full spectrum of combinations of data, ideas, people, and things–and do so in ways that are sensible given their scale assignments? Day and Rounds (1998) used a multidimensional scaling procedure to examine the visual relationships between UNIACT-R items completed by 49,450 college-bound high school students. A three-dimensional solution fit the data well, and revealed remarkably similar underlying structure across the ten groups (five racial/ethnic groups by gender). Dimension 1 of the three-dimension solution represented data versus ideas, and dimension 2 represented people versus things. Items plotted on the 1–2 dimensional plane showed good circular coverage, with nearly all items clustering in areas consistent with Holland's types. For example, 13 of 15 Arts items located in the Ideas-People quadrant (compare to Figure 1.1), and the remaining two items were nearby. Thus, like UNIACT scales, UNIACT items also display structure consistent with underlying theory, and structural invariance across gender and racial/ethnic groups.

Evidence of Convergent and Discriminant Validity

To the extent that UNIACT scales possess convergent and discriminant validity, one would expect relatively high correlations with other measures of similar constructs, and low correlations with measures of dissimilar constructs. ACT (2001) summarized the results of numerous analyses, involving more than 5,500 people, which support these expectations. More recently, a study involving five interest inventories found good evidence of convergent and discriminant validity for UNIACT-R (Savickas, Taber, & Spokane, 2002).

Correlations with abilities. It is becoming increasingly apparent that a wide range of work-relevant abilities (e.g., sales, leadership) play an important role in career decision-making (ACT, 2001, p. 67; Prediger, 2002). Although vocational interests and abilities differ conceptually, theory suggests they should be related (Holland, 1997). ACT's Inventory of Work-Relevant Abilities (IWRA) is designed to collect informed self-estimates for 15 abilities, leading to scores on the same six career clusters provided by UNIACT. (Information on IWRA validity for career exploration is available in ACT [2001]). Because UNIACT and IWRA report scores on parallel scales, we should expect corresponding scales (e.g., the UNIACT Arts scale and the IWRA Arts scale) to display higher correlations than noncorresponding scales.

Table 4.3 displays correlations between UNIACT-R and IWRA scale scores for a nationally representative sample of grade 10 students. As expected, correlations between corresponding scales (on the main diagonal) exceed off-diagonal correlations in every case. Correlations between corresponding scales ranged from .35 to .50 (median of .43). Similar results were obtained for grade 8 (ACT, 2001, p. 43). These results support the convergent and discriminant validity of UNIACT and suggest that conceptually similar measures of interests and abilities are moderately related. As one would expect, only weak relationships have been found between UNIACT scales and conceptually dissimilar measures of ability, such as traditional, objectively tested measures of academic ability (e.g., ACT, 1995; Tracey, Robbins, and Hofsess, 2005).

Table 4.3
Correlations between UNIACT-R and IWRA Scales

	UNIACT-R scale					
IWRA scale	ST	AR	SS	AS	BO	TE
Science & Technology (ST)	**43**	20	20	23	21	16
Arts (AR)	23	**50**	28	23	06	07
Social Service (SS)	23	22	**43**	34	13	–03
Administration & Sales (AS)	21	16	28	**43**	28	05
Business Operations (BO)	23	09	26	30	**35**	04
Technical (TE)	25	14	08	12	18	**37**

Note. Correlations between corresponding scales are boldface. Decimal points are omitted.

Sample consists of a nationally representative sample of 7,330 grade 10 students who completed both UNIACT-R and IWRA in 1997.

Evidence that UNIACT Identifies Personally Relevant Career Options

According to Holland (1997), people tend to gravitate to, and remain in, environments consistent with their type. It follows that people occupying a Holland environment will be expected to have interests that agree with that environment. Thus scientific interests should predominate among people in science groups (e.g., biology majors, employed chemists); artistic interests should predominate among people in arts groups (e.g., music majors, employed graphic artists), and so on. To be valid for use in career exploration and counseling, measures of Holland-type interests should reveal these theory-consistent differences between criterion groups. Instruments that cannot do this cannot support the profile-similarity approach to test interpretation ("You look like people who…") used by most career counselors and career assessment instruments (see Goldman, 1971; Prediger, 1999).

Assignment to criterion groups. People must be assigned to criterion groups prior to examining criterion-related validity. A common method of determining criterion group membership is to select people occupying the same occupation or college major. In addition, occupational choice (vocational aspiration, etc.) and major choice have also been used and defended as criteria for career-related measures. For example, Holland, Gottfredson, and Baker (1990) cited data showing that "aspirants for particular occupations resemble the employed adults in the same occupations" (p. 341). Additional research on this topic has been described by Prediger (1998), and UNIACT score profiles consistent with theory are routinely found for high school seniors based on occupational choice (ACT, 2001). In summary, research supports the use of criterion group membership based on either occupancy or choice.

Score profiles. A straightforward way to determine whether members of a criterion group score highest on their corresponding Holland-type scale is to examine their profile of mean scale scores. For example, Emmerich, Rock, and Trapani (2006) reported mean UNIACT-R scale scores for people in nine teaching specialties. The profiles made good sense: the science teachers scored highest on the Science & Technology scale, the art teachers scored highest on the Arts scale, etc. Profiled UNIACT-R scores for more than 1,900 people, covering a wide range of occupation and occupational choice groups, are found in ACT (1995, pp. 51–53). With few exceptions, UNIACT-R score profiles for criterion groups conform to theoretical expectations.

Hit rates. A different approach to assessing the validity of Holland-type measures involves using the predominant interest type (high-point code) for criterion groups to calculate the percent of agreement between criterion group membership and predominant interests (*hit rate*). For example, a group of biology students would be counted as a hit if their highest average score was on the UNIACT Science & Technology scale. If eight of sixteen total groups obtain high-point codes on scales that agree with their group, the hit rate would be 50%. This approach provides quantitative evidence of UNIACT validity based on the predominant interests of criterion *groups*.

Another approach to determining hit rates requires that each participant in the study be assigned to one of Holland's six types on the basis of criterion group membership. A person is counted as a hit if his or her high-point code agrees with his or her Holland-type assignment. Thus, a biology student would be included in the Science & Technology (Holland's I-type) group and would be counted among the hits if his or her highest score was on the Science & Technology scale. The percentage of people who are hits (the hit rate) is then computed for each of the six groups. This approach provides quantitative evidence of validity based on the predominant interests of *individuals*.

While several options are available for calculating the overall hit rate based on individuals, we take the average of the group (Holland type) hit rates. Because each group is weighted equally (1/6), Holland groups with large numbers of people cannot dominate the results. This method (resulting in an *unweighted hit rate*) is appropriate when every group matters–such as when examining validity for career counseling applications (Prediger, 1977). When unweighted hit rates are used with Holland-type criterion groups, the chance hit rate equals 17% (1/6).

The following discussion is divided into two parts. First, research is presented that provides quantitative evidence of UNIACT validity based on the predominant interests of criterion groups. Second, research is presented that provides quantitative evidence of validity based on the predominant interests of individuals in criterion groups.

Agreement Between Criterion Group Type and the Predominant Interests of Groups

As described above, this approach examines the percent of agreement (hit rate) between criterion group membership and the predominant interests of the group. Because of its basis in Holland's theory of careers, the index provides evidence relevant to both criterion-related validity and construct validity.

Example study. Hit rates were recently examined for a sample of college alumni representing nearly 300 academic institutions nationwide. Data were collected by yearly survey over a 15-year period (institutions determined which alumni to contact), and vocational interests were obtained by matching cases back to ACT records. A complete set of UNIACT-R standard scores ($M = 50$, $SD = 10$), obtained from 1991–2006 ACT files, was available for a total of 10,371 alumni. Each respondent's current occupation, collected from the survey, was assigned to one of ACT's career areas. (As described in Chapter 1, career areas are subsumed by six career clusters paralleling Holland's six types.) For the 21 career area groups with sufficient data ($N \geq 50$), 17 (81%) displayed agreement between their cluster and their high-point code (including ties for highest).

Summary of research. This validation approach was applied to the 648 criterion groups (more than 79,000 people) listed in ACT (1995, Appendix C). Data collection involved both longitudinal and cross-sectional designs, and samples included twelfth grade students, community and 4-year college students, and employed adults. Each of the studies identified a high-point code or a tie for high-point code. Table 4.4 presents hit rate percentages for all 648 groups and breaks down hit rates by time interval and age group. Two types of agreement are shown:

1. "Direct agreement" refers to a criterion group's highest mean interest score (high-point code) agreeing with the career cluster (type) for that group. When the mean score on the theory-consistent scale was tied for highest the case was excluded from the calculation of this hit rate.
2. "Direct agreement or tie" refers to all criterion groups meeting the first definition above or having the mean score on the theory-consistent scale tied for highest.

As can be seen in Table 4.4, the total direct hit rate across all 648 groups was 74%–73% if ties for highest are excluded. All hit rates in Table 4.4 are quite high–far exceeding chance. These results support the use of UNIACT in career exploration and counseling. Moreover, given the time intervals between testing (e.g., during the senior year of high school) and group assignment (e.g., current occupation after college graduation) in the longitudinal studies, these results are consistent with decades of research showing that vocational interests predict future career behaviors (Fouad, 1999).

Agreement Between Criterion Group Type and the Predominant Interests of Individuals

As described above, this method of assessing interest inventory validity involves classifying each study participant into one of Holland's six types on the basis of criterion group membership. A person is counted as a hit if his or her high-point code matches his or her criterion group. In effect, this approach asks whether people in a given group would have been referred to that group by their interest scores.

Example study. The results of an example study are shown in Table 4.5. UNIACT-S item responses were obtained for a systematic random sample of 10,992 high school seniors who registered for the ACT in 2003–04, completed all 72 items, reported an occupational choice, and reported that they were *very sure* of their occupational choice. Students were assigned to career clusters on the basis of their occupational choice. The unweighted average hit rate was 42%. This is considerably higher than the 17% hit rate expected by chance, and nearly identical to previously reported hit rates (ACT, 2001, p. 49) for high school seniors who completed the 90-item UNIACT-R.

Summary of research. The above approach for assessing ACT Interest Inventory validity has been employed in 14 studies (six of longitudinal design) involving more than 68,000 people. Results of these studies are summarized in ACT (2001, p. 49). Unweighted average hit rates ranged from 31% to 55% (median of 42%) across the 14 studies. As would be expected, the higher hit rates generally were achieved in studies involving concurrent designs and criterion groups based on occupancy.

Table 4.4
Group-Interest Hit Rates for 648 Criterion Groups

	Direct agreement		Direct agreement or tie	
Study characteristic	%	*n*	%	*n*
Time interval				
Concurrent	73	326	75	346
Longitudinal	74	290	75	302
Age[a]				
H.S. senior	72	199	74	216
College	70	302	70	306
Adult	81	115	83	126
Total	73	616	74	648

Note. This table reports hit rates for UNIACT profiles of 648 criterion groups reported in ACT (2001). Percentages are the average percent of agreement across the six Holland types. The hit rate expected by chance alone is 17% (1 out of 6). [a]Age when assigned to the criterion group.

Table 4.5
UNIACT-S Criterion Group Hit Rates: Grade 12

	Males		Females		Total	
Group	*n*	Hit rate	*n*	Hit rate	*n*	Hit rate
Science & Technology	1,596	36	2,471	38	40,667	37
Arts	527	50	931	49	1,458	50
Social Service	523	22	2,789	25	3,312	25
Administration & Sales	540	34	570	34	1,110	34
Business Operations	86	56	198	76	284	70
Technical	598	37	163	24	761	34
Total	3,870	39	7,122	41	10,992	42

Note. A systematic random sample of twelfth graders who registered for the ACT in 2003–04, completed all 72 items, and reported they were *very sure* of their occupational choice.

Validity Evidence for Demographic Groups

Gender

Over the past 25 years, research on the validity of UNIACT has often involved the comparison of males and females. As reported in Table 4.2, and seen in Figure 4.1, UNIACT-S scale structures for males and females are very similar and in accord with Holland's theory. Additional support comes from several studies involving UNIACT-R and large national samples of high school students. For example, both Day et al. (1998) and Tracey and Robbins (2005) found that scale structure aligned with Holland's theory, and that structures did not differ for males and females. Good structural fit to theory has also been reported for several large samples of high school students and adults (ACT, 1995, pp. 40–45). Very similar scale structures were found for males and females, and the generalizability of the underlying Data/Ideas and People/Things Work Task Dimensions was supported. These results mirrored those found by Prediger (1982) over a decade earlier.

Gender differences in criterion-related validity also appear to be minimal. As discussed earlier, Table 4.5 shows hit rates, based on UNIACT-S, for college-bound students assigned to career clusters on the basis of occupational choice. Males and females obtained nearly identical hit rates (39% and 41%, respectively). For context, readers can compare these hit rates to hit rates reported in past studies involving UNIACT. For example, nearly identical hit rates (42% and 40%, respectively) were found for a similar sample of college-bound students who completed UNIACT-R in 1994 (ACT, 2001, p. 49). In other examples, two studies using criterion groups based on current occupation obtained an average hit rate of 44% for both males and females (ACT, 2001, p. 49). While other researchers and publishers do not typically provide the information needed to determine unweighted hit rates, the UNIACT-R unweighted hit rates reported here for males and females exceed the known unweighted hit rates for similar instruments (see ACT, 1995, p. 66).

Racial/Ethnic Groups

Extensive evidence is available that supports the structural validity (i.e., scale relationships consistent with Holland's theory) of UNIACT scales for many U.S. racial/ethnic groups. In a recent study, Gupta, Tracey, and Gore (2008) examined the structural validity of UNIACT-R for people in five racial/ethnic groups (African Americans, Asian Americans, Euro-Americans, Latinos, and Native Americans). The sample consisted of more than 115,000 high school juniors in Colorado and Illinois who completed the ACT in 2004 as part of a statewide testing program. Students self-reported their racial/ethnic group. Using several methods to examine structural validity, the investigators found good fit to Holland's theory for all groups, with no significant differences among the groups. The authors concluded that counselors can use UNIACT-R with confidence when working with any of these five racial/ethnic groups.

Earlier studies echo these findings. For example, Day et al. (1998) examined UNIACT-R scale structure for a large national sample of college-bound high school seniors. Racial/ethnic group was based on self report. The investigators found scale structures in line with Holland's model for all groups and no significant racial/ethnic group differences. Using a longitudinal sample of high school students who had completed UNIACT-R in grades 8, 10, and 12, Tracey and Robbins (2005) compared scale structure to Holland's model across seven racial/ethnic groups. Again, scale structure conformed to theory and did not differ by racial/ethnic group. Finally, extensive information on the appropriateness of using UNIACT-R with different racial/ethnic groups is discussed at length in ACT (1995, chap. 9), including a comparison of scores and scale structures for the same racial/ethnic categories examined by Gupta et al. (2008) and Day et al. (1998).

Unlike many interest inventories, evidence for criterion-related validity is available for UNIACT across a wide range of U.S. racial/ethnic groups. Rather than only reporting hit rates for criterion groups or individuals, as described earlier in this chapter, analyses in the prior edition of the UNIACT technical manual (ACT, 1995, chap. 9) also visually compared the plotted interests of 20 criterion groups for each of five racial/ethnic groups (African Americans, Asian Americans, Euro-Americans, Latinos, and Native Americans). Using formulas described in Appendix C of this manual, UNIACT-R scores for criterion groups (based on occupational choice) were converted to scores on the data/ideas and people/things dimensions, permitting the plotting of coordinates on the two dimensions underlying Holland's hexagon (see Chapter 1). The locations of criterion groups generally made good sense, regardless of racial/ethnic group. For example, all five accounting criterion groups located

high on the data side of the data/ideas dimension, and all five medicine criterion groups located in the lower left quadrant of the plot, displaying interest in both people and ideas. These locations, and almost all of the other criterion group locations, were as expected given the locations of similar groups on the ACT World-of-Work Map (see Chapter 1). Quantitative analyses indicated that, with few exceptions, criterion group locations were similar across racial/ethnic groups.

A related approach, involving the conversion of UNIACT scores of college seniors to coordinates on the data/ideas and people/things dimensions, is described in ACT (1981). Hits, defined on the basis of proximity to the known locations of college majors on the dimensions, were calculated for students representing the same five racial/ethnic categories noted above. Hit rates were generally high for members of all groups. Taken together, these diverse validity studies–covering both structural and criterion-related validity and involving more than 145,000 people–consistently support the use of UNIACT across a wide range of U.S. racial/ethnic group members.

Summary

This chapter summarizes the evidence that UNIACT scales function in ways that are consistent with the theory on which they are based. This evidence is based on various analytic methods and involves very large numbers of people across the demographic spectrum. Targeted principal components analyses, as well as other multivariate approaches, support the structural validity of the scales and the generalizability of the Data/Ideas and People/Things Work Task Dimensions. Structural validity has been repeatedly demonstrated for males and females, as well as across a wide range of age groups and racial/ethnic groups. Analyses examining the convergent and discriminant validity of UNIACT scales reveal, as expected, higher correlations with measures of similar constructs and lower correlations with measures of dissimilar constructs. These patterns have been found for measures in both the interest and ability domains. Finally, a wide variety of evidence supports the criterion-related validity of UNIACT. The predominant interests of 669 occupational, occupational choice, and academic major groups (representing data for more than 89,000 people) were found to agree with their Holland types at a high rate–about four times the chance hit rate. Hit rates based on agreement between criterion group type and the predominant interests of individuals were also high–generally between two and three times the chance hit rate. Taken together, these results clearly support the use of UNIACT-S and UNIACT-R in career exploration and counseling. Despite the reduced scale length of UNIACT-S, the evidence indicates that the theory-based validity of the instrument remains at levels comparable to prior editions.

5
More Validity Evidence: Outcome Prediction and the Use of UNIACT with Other Measures

It has become increasingly clear that some noncognitive variables, such as personality factors and vocational interests, contribute to the prediction of important academic and occupational outcomes (Ployhart, Schneider, & Schmitt, 2006; Robbins, Allen, Casillas, Peterson, & Le, 2006; Trapmann, Hell, Hirn, & Schuler, 2007). For example, correlations between interests and academic achievement, based on a meta-analysis involving 189 correlations, were .31 or higher for most academic subject areas (Schiefele, Krapp, & Winteler, 1992). Because interests play an important role in motivating and sustaining human behavior (Silvia, 2008), such relationships are to be expected. In contrast to uninteresting activities, interesting activities generate more attention and effort, and lead to greater satisfaction (Savikas, 1999). Interests thus play an important role in goal-directed behavior, frequently contributing to decisions involving effort and persistence, such as when job seekers look for work they are interested in, or when educators attempt to cultivate student interest in various subject areas.

One of the defining characteristics of interests is that they are expressed differentially across the spectrum of human activities. We aren't interested in everything–our interests vary by type of activity. These patterns of interests develop over time, reflecting fundamental self-evaluations such as self-concepts (Super, 1963), perceived abilities, expected success, and anticipated satisfactions (Barak, 2001). Holland's theory of careers, described in Chapter 1, provides a framework for understanding the person-environment interactions that lead to these patterns of crystallized interests. According to this theory, most people and environments can be categorized into one of six broad vocational personality types (see Chapter 1), each type characterized by a set of interests, abilities, and values. People tend to gravitate to, and remain in, environments dominated by the same type of people (Oleski & Subich, 1996). A person with scientific interests and abilities, for example, is likely to gravitate to science majors and science occupations. Such environments provide opportunities to engage in preferred activities, use abilities, and express attitudes and values consistent with that environment. These opportunities are rewarding and, over time, strengthen and refine a person's primary interests (Holland, 1997).

These considerations lead to two general propositions about valid measures of Holland's six interest types. First, we would expect a person's interests to be related to future environment (such as occupation or college major). Second, the level of agreement between a person's interests and environment should be related to certain kinds of outcomes. For example, agreement between a person's interest and environment type may lead to greater persistence, satisfaction, and success.

The first section of this chapter addresses these propositions, and in doing so presents validity evidence related to the use of UNIACT scores to predict academic and occupational outcomes. Interested readers may want to consider this evidence in the broader context of research on the impact of person-environment agreement on academic outcomes (e.g., Seidman, 2005) and occupational outcomes (e.g., Kristof-Brown, Zimmerman, & Johnson, 2005). While UNIACT serves as a stand-alone career-relevant measure in most ACT programs, in some programs it is used with other measures. The second section of this chapter summarizes some of the validity evidence pertaining to the use of UNIACT when reported in tandem with other career-relevant measures, or when combined with other career-relevant measures.

Prediction of Environments and Outcomes

Environments

Translating Holland's theory into the academic context, Smart, Feldman, and Ethington (2000, p. 33) suggested that "students choose academic environments compatible with their [Holland] personality type." These investigators and others (e.g., Porter & Umbach, 2006) have found support for the idea that Holland types predict choice of college major. Using UNIACT-R data from high school students who reported a planned college major and graduated in 2007 ($N = 709{,}929$), ACT (2008a) obtained correlations between the score

profiles of these students and their respective planned majors. The latter were defined as the score profiles of high school graduates in 2003–05 with the same planned college major. Across all students, the median correlation was .50, indicating that students' interest profiles were related to the interest profile of their planned major.

In the context of occupations, the predictive validity of vocational interests has been the focus of research for many decades. Scores from a number of well-known interest inventories have been shown to have value in predicting future occupation, among them the Strong Interest Inventory (Hansen & Dik, 2005; Spokane, 1979), the Kuder Occupational Interest Survey (Rottinghaus, 2007; Zytowski, 1976), and the Career Decision-Making System (Harrington, 2006). As summarized in Chapter 4, longitudinal studies of UNIACT hit rates, involving interests collected 1–8 years prior to criterion group membership, produced remarkably high hit rates. Membership was correctly predicted for 74% of 290 diverse criterion groups (Table 4.4). While space does not permit a comprehensive review of this topic, studies have repeatedly shown that vocational interests are related to future environment.

Congruence

The term *fit* is typically used to convey level of agreement between a person and the environment. Over the years, a wide range of cognitive and personality factors have been used to assess person-environment fit. For example, a number of researchers have examined how values-based person-organization fit relates to job performance (Hoffman & Woehr, 2006). The term *congruence* is typically used to convey level of agreement between a person's interests and the environment. Methods for measuring fit and congruence vary, but all require that both the person and the environment have scores on corresponding sets of variables. Four methods have been used in research involving UNIACT to index interest-environment congruence. To facilitate the discussion that follows, the four methods are described below:

1. *Holland code comparison.* This category of congruence indices encompasses several procedures that compare two sets of Holland codes (using three letters or less). These procedures are based on Holland's hexagonal structure and are sensitive to code order. The C index (Gore & Brown, 2006) may be the best known example of this type of index. Two nearly identical three-letter codes (e.g., ERC and ECR) would result in a high congruence score on the C index because they share identical codes in nearly identical order.
2. *Profile correlation.* As the name implies, this method involves calculating the product-moment correlation between the score profiles of a person and the environment. A common criticism of this method is that it ignores differences in overall score magnitude, however, empirical reviews have pointed to the superiority of the profile correlation method in research on person-environment fit (Arthur, Bell, Villado, & Doverspike, 2006; Verquer, Beehr, & Wagner, 2003).
3. *Euclidean distance.* This method involves converting person and environment data into coordinate points on the data/idea and people/things dimensions that underlie the six UNIACT scales (see Chapters 1 and 4). Equations typically used to convert UNIACT scores to scores on these dimensions are provided in Appendix C. When score profiles for environments are not available, investigators usually estimate environment locations by assigning environments to ACT career areas on the World-of-Work Map (see Chapter 1). Research published to date defines the Euclidean distance congruence index as the point-to-point, straight-line distance between the coordinates for the person and the environment, where smaller distances indicate more similarity (greater congruence). Interpretation of Euclidean distance is complicated by two factors. First, as noted by Prediger and Vansickle (1992), this distance confounds the direction of interests (the angular position of the coordinates with respect to center) and the clarity of interests (the distance of the coordinates from center). Second, difference scores are interpretable only to the degree that the properties of the scores in question are comparable. Research published to date that assigns environments to ACT career areas has based these assignments on the second edition of the World-of-Work Map, but career area locations on that edition of the map have arbitrary distance-from-center measurement properties. Thus distance measures based on that edition of the map are difficult to interpret given the known dissimilar measurement properties of UNIACT scores and career area locations.

4. *Angular distance.* The angular distance method involves converting person and environment score profiles into angular information on the data/idea and people/things dimensions underlying the six UNIACT scales (see Chapters 1 and 4). Equations for converting six Holland-type scores to angles on these dimensions are provided by ACT (1995, p. 126). When score profiles for environments are not available, investigators usually estimate environment angles by assigning environments to ACT career areas on the World-of-Work Map (see Chapter 1). The angular distance method does not have an interest clarity component, and thus avoids the conceptual confound in the Euclidean distance method. In addition, the interpretability of the scores is preserved because angles from any source are based on the same units of measurement. However, interpretation of angular distance scores can be problematic for interest profiles with coordinates near the center of the circular structure. Reliability is lower near the center, because nearly identical locations on opposite sides of a bipolar dimension can differ widely, by as much as the maximum angular difference possible.

The studies that follow examine two broad types of outcomes: stability and success. Stability outcomes refer to outcomes such as persistence and goal attainment. Typically these outcomes are dichotomous: e.g., students either persist in their entering majors to their third year, or they do not. Success outcomes are specific to the environmental setting, such as grade point average (GPA) in academic settings or earnings in occupational settings. For the sake of completeness, studies examining satisfaction are also included in this category.

Interest-Major Congruence and Stability Outcomes

Persistence. UNIACT has been used in several studies to examine the relationship between interest-environment congruence and persistence. These studies, all pertaining to persistence in academic settings, have produced consistently positive results. In the earliest instance of ACT research on this topic, Laing, Swaney, and Prediger (1984) investigated the relationship between measured interests (UNIACT-A), planned major, and persistence in an academic major. Interests and planned major were collected in grade 12, and persistence was examined for each of four levels of an interest-planned major congruence index based on Holland code comparison. They found that the percentage of students persisting in their planned major increased systematically with the level of congruence between measured interests and planned major. When interests and planned major were in very close agreement, 67% of students persisted in their chosen major to their senior year.

As one would expect, first-year academic performance plays a large role in predicting educational persistence (Pascarella & Terenzini, 2005). So it is reasonable to ask whether interest-major congruence makes an independent contribution, beyond first-year academic performance, to the prediction of major persistence. Allen and Robbins (2008) studied a sample of nearly 48,000 students, all of whom had UNIACT-R scores, an entering major, and a known major during their third year of college. Seeking a precise measure of interest-major congruence, they split their sample into estimation and validation groups, converted UNIACT-R scale scores to scores on the Data/Ideas and People/Things Work Task Dimensions, and used the estimation group to identify major-specific coefficients that optimized the prediction of major persistence. An interest-major composite score was defined as a linear function involving the major-specific coefficients and scores on the two work task dimensions. The validation group was then used to measure the predictive relationship between the interest-major composite score and major persistence. They found that both first-year GPA and interest-major congruence affected persistence in entering major. The odds of students persisting in their entering major increased by 47% for each standard deviation increase in the interest-major composite score.

Another recent study involving UNIACT data examined the use of interest-major congruence in predicting major persistence into the third and fourth years of college. Congruence was determined by the profile correlation method, with score profiles for majors based on the mean interest scores of successful and persistent college students obtained from separate samples. (Unlike the study described above, coefficients optimizing the prediction of major persistence were not used.) Across two large samples totaling more than 57,000 students, the average odds of students persisting in their major increased by 23% for each standard deviation increase in congruence (ACT, 2008a; Allen & Robbins, 2009). In sum, the evidence clearly indicates that interest-major congruence, as assessed using UNIACT, is predictive of persistence in a college major.

Attainment. Since changes in one's major contribute to delays in completing a program of study, and interest-major congruence minimizes changes in one's major, it is reasonable to expect that people exhibiting interest-major congruence will complete a program of study in a more timely fashion. Allen and Robbins

(2009) used the profile correlation method to examine the relationship between interest-major congruence and timely degree attainment for a sample of more than 3,800 college students. Major and graduation status were collected yearly from institutions for students who had completed UNIACT-R in high school as part of the ACT. Timely degree attainment was defined as four years or less for students in four-year colleges, and two years or less for students in two-year colleges. Score profiles for majors, based on the mean interest scores of students, were obtained from a separate sample of postsecondary students who had persisted into their second year of college with a GPA of at least 2.00. These investigators found that higher levels of congruence lead to a greater likelihood of attaining a degree in a timely fashion. For each standard deviation increase in interest-major congruence, the odds of timely degree attainment increased by 18% for students in four-year colleges and 26% for students in two-year colleges. Subsequent research addressing this question, using a similar methodology and a larger sample, found that the odds of timely degree attainment increased by 12% for each standard deviation increase in interest-major congruence (ACT, 2008a).

The logic underlying the relationship between interest-major congruence and attaining a college degree also applies to occupational settings. In both educational and occupational settings, person-environment congruence leads to more opportunities to act on preferences and develop skills, increasing the likelihood that the person will persist and succeed in that type of environment. Thus, for example, we would expect that interest-major congruence in college will increase the likelihood that graduates will obtain a job in the same field as their major. Results of recent analyses support this hypothesis. Current job and degree field were collected for a sample of more than 12,000 alumni from 290 colleges and universities nationwide. Survey data were matched back to UNIACT-R scores from high school. Results indicated that people who obtained a college degree in a field congruent with their measured interests were more likely to obtain a job in that same field after graduation (ACT, 2008b).

Retention. Because dissatisfaction with major is among the reasons why students leave their academic institution, one might expect interest-major congruence to be related to student retention. Studies using UNIACT to examine this question have typically produced ambiguous results (Leuwerke, Robbins, Sawyer, & Hovland, 2004; Tracey & Robbins, 2006). This question was recently examined with a sample of more than 370,000 ACT-tested students. Congruence was determined by profile correlation, and score profiles of majors were based on mean interest scores of college students from a separate sample. The odds of students returning to their colleges for the second year increased by only 3% for each standard deviation increase in congruence (ACT, 2008a). These results make some sense. There are many reasons why students leave college (Seidman, 2005), and few relate to vocational interests.

Congruence and Success Outcomes

UNIACT-R has been used in several studies to examine the relationship between person-environment congruence and success-related outcomes. In the academic domain, research conducted by Tracey and Robbins (2006) suggests that interest-major congruence is related to GPA. Their sample consisted of more than 520,000 students from 87 colleges and universities in four states. Measures of academic achievement (ACT Composite scores), UNIACT-R scores, and GPA at up to three points in time (after the first year, second year, and at graduation) were available for each student. They found that both Euclidean and angular measures of congruence predicted GPA at all three times. Both congruence measures predicted GPA above and beyond levels provided by ACT Composite scores. In the occupational domain, recent research using UNIACT-R suggests that interest-occupation congruence is associated with higher self-reported earnings (Neumann, Olitsky, & Robbins, 2008).

The topic of satisfaction is relevant to the discussion of successful outcomes. Job performance and job satisfaction are related both empirically (Judge, Bono, Thoresen, & Patton, 2001) and theoretically (e.g., Lofquist & Dawis, 1969). Numerous studies have shown that person-environment fit, defined in a variety of ways, relates to satisfaction (e.g., Kristof-Brown et al., 2005), and this also applies to interest-environment congruence (Spokane, Meir, & Catalano, 2000). While no recent research on this topic has been done with UNIACT, two older reports can be noted. Wallace (1978) reported a positive and sizeable relationship between interest-major congruence and satisfaction with college major, and Swaney and Prediger (1985) found a modest relationship between interest-occupation congruence and job satisfaction.

Overall, the UNIACT-based evidence presented here clearly indicates that indices of interest-environment congruence are related to a diverse range of outcome criteria pertaining to stability (persistence and attainment), success (GPA, earnings), and satisfaction. These results are consistent with theory and support the use of UNIACT in congruence indices to predict such outcomes.

Using UNIACT with Other Measures

The validity of an instrument should be evaluated in light of the constructs it is designed to measure and the ways it will be used. The uses of UNIACT vary by ACT program–in most programs it serves as a stand-alone measure of vocational interests, in other programs it is used in tandem with other measures, and in one program it is used in combination with another measure. When used in tandem, UNIACT and other career assessment results are reported separately but are interpreted in light of one another. When used in combination, UNIACT and a values assessment are combined in scoring and results are reported as a single composite score. This section discusses the validity of UNIACT in tandem with a measure of self-estimated abilities, and the validity of a composite index consisting of UNIACT and a measure of work values.

UNIACT in Tandem with Work-Relevant Abilities

As discussed in Chapter 1, the Career Planning Survey is a comprehensive career guidance program that prepares students (grades 8–10) to make informed education and career decisions. The formal assessment components consist of UNIACT-R and the Inventory of Work-Relevant Abilities (IWRA), an inventory of ability self-estimates (ACT, 2001, p. 4). IWRA is intended for use in a comprehensive search for occupations with counselee-compatible work tasks–i.e., developmental career counseling. Prediger (2002) describes the rationale for using UNIACT and IWRA in tandem for developmental career counseling, as well as the types of validity evidence that would support this intended use.

When these measures are used in tandem, *agreement validity* refers to the hit rate when UNIACT and IWRA agree. In addition, we can define *tandem validity* as the total hit rate combining UNIACT hits with IWRA hits for UNIACT misses. (See Chapter 4 for a description of hit rates.) Table 5.1 shows both types of hit rates for two samples. The national sample was a nationally representative sample of 12th graders, and the cross-sectional sample consisted of 12th grade students from two urban, two suburban, and two rural schools in six states representing several regions of the United States (ACT, 2001, p. 52). Sample members were assigned to Holland types on the basis of expressed occupational choice and certainty. As seen in Table 5.1, the obtained hit rates for UNIACT-R (41% and 44%) are substantially above chance and in line with hit rates reported in Chapter 4. When UNIACT-R and IWRA high-point codes agree, the hit rates are 50% and 57%, both substantially above chance and above the separate hit rates. The tandem hit rates are also uniformly high (55% and 58%). These data indicate that UNIACT and IWRA, when used in tandem, have validity for use in career counseling applications. Counselors can have confidence in career suggestions based on UNIACT and IWRA, especially when results of both inventories agree.

Table 5.1
Career Counseling Validity of Tandem Use of UNIACT and IWRA

		Hit Rates for Holland-type criterion groups		
			UNIACT and IWRA	
Sample	*N*	UNIACT hit rate[a]	Agreement hit rate[b]	Tandem hit rate[c]
National	1,503	41	50	55
Cross-sectional	296	44	57	58

Note. Hit rates are based on high-point code (see Chapter 4). All chance rates are 17% except for the tandem condition, which is 27%. [a] The hit rate for UNIACT alone (see hit rates in Chapter 4). [b] The hit rate when UNIACT and IWRA agree. [c] The total hit rate combining UNIACT hits and IWRA hits for UNIACT misses.

The agreement and tandem hit rates in Table 5.1 indicate that self-estimated abilities make a unique contribution to validity, beyond that of interests. Nevertheless, UNIACT and IWRA do share variance, with correlations between parallel scales ranging from .35–.50 (see Table 4.3), and correlations between parallel Data/Ideas and People/Things dimension scores in the high forties (Tracey & Hopkins, 2001). Using canonical correlation analyses, Tracey and Hopkins showed that UNIACT and IWRA displayed considerable common variance but that both made unique contributions to the prediction of occupational choice.

UNIACT in Combination with Work-Relevant Values

The WorkKeys Fit Assessment evaluates the fit between interests and the corresponding characteristics of occupations, and between work values and the corresponding characteristics of occupations. Interests are measured by the Level 2 UNIACT-S, and work values are measured by an 18-item adaptation of the 22-item Inventory of Work-Relevant Values used in DISCOVER (ACT, 2008c). Characteristics of occupations that correspond to these interests and values are based on information for 949 occupations in the current O*NET database (National Center for O*NET Development, 2006). The Fit Assessment permits job incumbents and job candidates to compare their interests and work values with corresponding profiles for specific occupations. The assessment provides information that can be used by employers, job incumbents, and job candidates for various job transition, development, and screening purposes. The scoring procedure combines interest-based and values-based fit information into a single index, with Fit Index scores ranging from 1 (lowest level of fit) to 99 (highest level of fit). The Fit Assessment score report provides Fit Index scores for multiple occupations. Extensive information about the Fit Assessment is provided in ACT (2008d).

Differentiation. A fundamental assumption underlying the concept of fit is that, given time, people tend to gravitate to occupations that are in harmony with their personal characteristics. If this assumption is true, and if the measure of fit is valid, then the measure should differentiate occupations that are identical to (or even similar to) respondents' own occupations from those that are not. For example, the measure should show more fit between incumbent salespersons and sales occupations than between incumbent salespersons and construction occupations. This assumption was examined for the WorkKeys Fit Assessment by Postlethwaite et al. (2009). Table 5.2 shows, for three levels of occupation similarity, median Fit Index scores and the percentages of Fit Index scores falling in each of three score levels. (Sample characteristics and score levels are described in the table notes.) The first row, called Identical, shows the percentage of respondents obtaining low, medium, and high Fit Index scores for their current occupations. The second and third rows show percentages for similar and dissimilar occupations, respectively.

Table 5.2

Percentage of Fit Index Scores by Score Level and Occupation Similarity

		Fit Index score level[b]			
Occupation similarity	*N* of scores[a]	Low	Medium	High	Median Fit Index score
Identical	503	7	46	47	77
Similar	29,154	12	48	40	72
Dissimilar	447,690	26	50	24	50

Note. These results are based on a sample of 503 employed adults assessed in 2006–07 (Postlethwaite et al., 2009). Most participants had been in the same occupation for at least two years. Participant occupations represented 21 of the 23 O*NET major occupational groups. [a] Number of fit score calculations. [b] Fit Index score levels are low (1–25), medium (26–75), and high (76–99).

As can be seen in Table 5.2, Fit Index scores vary considerably by level of occupational similarity, and the patterns are consistent with the assumption that people gravitate to occupations in line with their personal characteristics. Fit Index scores based on the current occupations of incumbent workers (the *identical* condition) resulted in the highest level of fit (median of 77). Fit Index scores based on similar occupations were lower, and scores based on dissimilar occupations were still lower. Statistical analyses confirmed that the Fit Index scores varied by level of occupational similarity. In sum, the Fit Index differentiates between occupations based on similarity to current occupation–essential evidence of validity for any measure of occupational fit.

Validity. These same data were used to determine observed (uncorrected) and corrected validity estimates for four outcomes likely to be related to person-occupation fit: job satisfaction, perceptions of job match, job commitment, and task performance (see Table 5.3). The job satisfaction criterion consisted of two general satisfaction questions, the job match criterion consisted of three questions concerning the degree to which participants perceived their current occupation as matching their interests and values, the job commitment criterion consisted of two questions asking participants to estimate their commitment to their occupation, and task performance was based on supervisor ratings. The satisfaction measure was available for all study participants, whereas the other measures were only available for a subset of participants (see Table 5.3).

Because observed validity estimates tend to be attenuated by a variety of biasing effects, such as measurement error in the criterion and range restriction in the predictor, psychometric techniques are often used to correct for biasing effects. Validity estimates in Table 5.3 are corrected for both of these biasing effects. After these corrections, the observed validity of the Fit Index for general satisfaction ($r = .09$) increased to .14, and task performance ($r = .19$) increased to .29. Similar increases occurred for the job match and job commitment criteria. Additional results are also described by Postlethwaite et al. (2009). For example, using hierarchical regression analyses, these investigators found that person-occupation fit provided unique incremental validity–above integrity test scores–for various ratings of job performance.

Table 5.3
Observed and Corrected Correlations of Person-Occupation Fit with Work Attitudes and Task Performance

		Operational validity	
Work criterion	Obs *r*	cME	cRR
	Work attitude		
General satisfaction [a]	.09	.11	.14
Job match [b]	.21	.24	.29
Job commitment [b]	.17	.19	.24
	Job performance		
Task performance[c]	.19	.24	.29

Note. These results are based on Postlethwaite et al. (2009). Criterion items are discussed in the text. Obs *r* = observed correlation; cME = corrected only for measurement error in criterion; cRR = cME further corrected indirect range restriction in the predictor. [a] $N = 503$. Observed correlations ≥.09 are significant ($p \leq .05$). [b] Based on a subset of 219 people. Observed correlations ≥.13 are significant ($p \leq .05$). [c] Based on a subset of 242 people. Observed correlations ≥.12 are significant ($p \leq .05$).

Validity estimates for occupational fit are typically small to moderate (Spokane et al., 2000). The corrected correlations reported here are in line with those reported in the literature. The correlations with task performance are encouraging and consistent with results reported earlier in this chapter showing that interest-environment congruence predicts success outcomes. In total, these results indicate that an index of person-environment fit, based on UNIACT-S in combination with a measure of values, differentiates occupations on the basis of similarity to current occupation and predicts desirable work attitude and job performance outcomes.

Summary

This chapter examines the validity of the ACT Interest Inventory from two perspectives. First, evidence is presented showing that UNIACT contributes to the prediction of important academic and occupational outcomes. Using UNIACT as the measure of interests, the evidence clearly indicates that interest-environment congruence is related to a diverse range of outcome criteria pertaining to stability (persistence in a college major, attainment of a college degree, and attainment of a job in the same field as the college degree), success (college GPA and job earnings), and satisfaction. These results are consistent with theory and support the use of UNIACT in congruence indices to predict such outcomes. Second, evidence is presented showing that UNIACT is valid for use in (a) career counseling applications when scores are reported in tandem with a measure of self-reported abilities, and (b) job transitioning applications when scores are combined with a measure of work values. When UNIACT scores are combined with work values, as is done in the WorkKeys Fit Assessment, the fit between the combined scores and the corresponding characteristics of occupations predict desirable work attitudes and task performance. In sum, the results presented in this chapter point to the utility of UNIACT in facilitating career development and helping people achieve academic and occupational success. As our economy becomes increasingly complex and specialized, career planning and job transitioning become more challenging and more essential. UNIACT results can play an important role in helping students and adults navigate through career information and options, stay motivated in the face of obstacles, and achieve their educational and occupational goals.

6
Reliability

This chapter summarizes the evidence of scale reliability for UNIACT-S and UNIACT-R. As noted in Chapter 1, the 72 items in UNIACT-S are a subset of the 90 items in UNIACT-R and, as shown in Chapter 2, the structural properties of these two editions are very similar. Thus technical information about one edition of UNIACT informs the other.

Internal Consistency

Internal consistency reliability assesses the extent to which people would obtain similar scores if they completed different sets of items from the same scale. Coefficient alpha (Cronbach, 1951) is used to estimate UNIACT internal consistency reliability.

UNIACT-S. Internal consistency estimates of reliability for UNIACT-S are shown in Chapter 2 (Table 2.6) for samples of students in grades 8, 10, and 12. Results for each grade level are based on 20,000 students (10,000 per gender) from nationally representative samples (Samples E, F, and G in Table 2.2). Although these students completed Level 1 of the UNIACT-R, the subset of 72 UNIACT-S items was scored to obtain UNIACT-S results. The median coefficient alphas across the six scales ranged from .84 (.82–.89) for grade 8 to .87 (.84–.91) for grade 12. Coefficients were very similar across gender. For example, coefficient alphas ranged from .85 to .92 (median = .86) for grade 10 males, and from .81 to .91 (median = .84) for grade 10 females. Similar results were obtained at the other grade levels. Reliabilities ranged from .81–.92 across all three grade levels.

Coefficient alphas for adults were obtained for a sample of 327 employed adults ranging in age from 19 to 66. Respondents completed Level 2 of UNIACT-S at their place of employment. The sample was mostly male (66%) and racially diverse (48% Caucasian). Alphas across the six scales ranged from .77 to .85 (median = .81). Benoit (2007) reported similar results for UNIACT-S Level 2 administered to a sample of college students (337 females and 127 males). Estimates ranged from .75 to .91 (median = .86) for females and from .78 to .90 (median = .86) for males.

UNIACT-R. Using the same samples mentioned above (E, F, and G in Table 2.2), we examined internal consistency estimates for the 90-item UNIACT-R. As seen in Table 2.6, alphas for UNIACT-R ranged from .84 to .91 (median = .86) for grade 8, and from .87 to .92 (median = .88) for grades 10 and 12. The UNIACT-R technical manual (ACT, 1995, p. 30) provides additional information on internal consistency reliability for this edition. For example, coefficient alphas ranged from .87 to .92 (median = .88) and from .83 to .92 (median = .88) for national samples of grade 12 males and females, respectively. These results are very close to the ranges reported in Table 2.6 for Sample G, providing further support for the reliability of the instrument.

Test-Retest Stability

Because vocational interests are generally stable over time (Low, Yoon, Roberts, & Rounds, 2005), it is difficult to have confidence in an interest inventory if people obtain widely different patterns of scores on separate administrations. Thus it is essential to examine the degree to which scores remain stable over time.

UNIACT-S. Long-term stability coefficients are summarized in Table 6.1. These data are based on high school students who completed UNIACT-R (as part of PLAN) during the 2001–02 or 2002–03 academic years, and again (as part of the ACT) during the 2003–04 academic year. After matching the PLAN and ACT cases, the sample consisted of a total of 424,760 students. Of these, 786 had a test-retest interval of 3–9 months, 50,318 had a test-retest interval of 10–14 months, and 373,656 had a test-retest interval of 15–33 months. Although these students completed Level 1 of the UNIACT-R, only the subset 72-items of UNIACT-S (Level 1) were used in these analyses.

As shown in Table 6.1, test-retest correlations for the 3–9 month interval ranged from .67 to .77 (median = .72) for females, and from .59 to .77 (median = .66) for males. Test-retest correlations for the 10–14 month interval ranged from .60 to .75 (median = .68) for females, and from .58 to .73 (median = .65) for males. Slightly lower stability coefficients are shown for the 15–33 month interval. Test-retest correlations of interest scales typically vary as a function of the length of the time interval (Low et al., 2005), and this is true for UNIACT as well.

Perspective on the magnitude of the UNIACT-S test-retest correlations in Table 6.1 is provided by comparing these coefficients to those obtained for

UNIACT-R. For example, the median test-retest correlation for UNIACT-S with a 3–9 (median = 8) month time interval is .70 for the total sample. Comparable results have been found for UNIACT-R. A median test-retest correlation of .70 was reported for a sample of 1,328 high school juniors and seniors who were tested twice over a 7–8 month time interval (ACT, 1995, p. 32). Perspective can also be gained by comparing UNIACT-S stability estimates to estimates from a wider range of interest inventories. Zarrella and Schuerger (1990) used multiple regression to examine the predictive relationship between various person/test situation characteristics (age and test-retest interval) and the stability of interest inventories. These investigators collected test-retest stability coefficients from 83 studies involving seven well-known interest inventories. Predicted coefficients of stability (defined as the mean test-retest correlation across all scales in the instrument) were derived for a matrix of 32 age-by-interval categories. The authors recommended using the expected mean test-retest correlations for these age-by-interval categories as general guidelines for evaluating test-retest reliabilities for individual interest inventories. UNIACT stability coefficients reported here, based on data from high school students age 15–18, generally correspond closely to the predicted coefficients. For example, the 15–33 month median stability coefficients for UNIACT-S were .61 and .63 for males and females, respectively (see Table 6.1). Expected stability coefficients over a 2-year interval for 15-year-olds and 20-year-olds, as determined by Zarrella and Schuerger, were .60 and .65, respectively.

UNIACT-R. Short-term stability was examined for samples of 606 ninth grade students and 416 eleventh grade students from a mix of schools in rural, suburban, and urban areas of Iowa. The time interval between UNIACT-R test administrations ranged from 6 to 15 days. Test-retest reliability coefficients across the six scales ranged from .79 to .87 (median = .81) for grade 9, and from .78 to .90 (median = .82) for grade 11 (Staples and Luzzo, 1999). These coefficients are impressive given the fact that the inventory was completed under two different conditions: a paper-based administration mode and a multimedia administration mode. More stability coefficients are reported in the UNIACT-R technical manual (ACT, 1995), which provides coefficients for seven samples (participants initially tested as high school juniors or seniors) with a wide range of testing intervals. Across the six scales, median coefficients for these samples ranged from .82 (three-week test interval) to .56 (four-year test interval).

Table 6.1
Stability Consistency for UNIACT-S (Level 1) Scales

			Basic interest scale coefficient	
Interval	Gender	*N*	Range	Median
3–9 months[a]	Females	490	.67–.77	.72
	Males	296	.59–.77	.66
	Total	786	.63–.77	.70
10–14 months[b]	Females	30,983	.60–.75	.68
	Males	19,335	.58–.73	.65
	Total	50,318	.60–.74	.67
15–33 months[c]	Females	219,267	.56–.71	.63
	Males	154,389	.54–.70	.61
	Total	373,656	.56–.71	.63

Note. [a] Median of 8 months; sample size *N* = 786. [b] Median of 13 months; sample size *N* = 50,318.
[c] Median of 22 months; sample size *N* = 373,656.

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Appendix A

List of Non-ACT-Sponsored Reports Involving UNIACT (1995–2008)

Ackerman, P. L. & Beier, M. E. (2006). Determinants of domain knowledge and independent study learning in an adult sample. *Journal of Educational Psychology, 98*(2), 366–381.

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Appendix B

UNIACT-S Directions and Items: Levels 1 & 2

The things you like to do now can give you clues about jobs you might like in the future. This inventory will help identify jobs you may want to explore. Show how much you would like doing each of the activities listed below. Mark an answer to an activity even if you are uncertain how you feel about it. Consider whether you would **like** or **dislike** the activity, not your ability to do it.

For **each** activity, choose one of the answers below. Try to answer **like** or **dislike** as often as possible.

I would **dislike** doing this activity . . . . . D
I am **indifferent** (don't care one way or the other) I
I would **like** doing this activity L

Level 1

1. Explore a science museum
2. Play a musical instrument
3. Help someone make an important decision
4. Conduct a meeting
5. Calculate the interest on a loan
6. Build a picture frame
7. Study biology
8. Draw cartoons
9. Teach people a new hobby
10. Campaign for a political office
11. Plan a monthly budget
12. Pack things into boxes
13. Learn about star formations
14. Write short stories
15. Entertain others by telling jokes or stories
16. Hire a person for a job
17. Sort, count, and store supplies
18. Assemble a cabinet from written instructions
19. Attend the lecture of a well-known scientist
20. Play in a band
21. Help settle an argument between friends
22. Discuss a misleading advertisement with a salesperson
23. Figure shipping costs for catalog orders
24. Design a bird feeder
25. Learn how the brain works
26. Prepare drawings to illustrate a magazine story
27. Give a tour of an exhibit
28. Develop new rules or policies
29. Prepare a budget for a club or group
30. Build furniture
31. Read books or magazines about new scientific findings
32. Write a movie script
33. Help rescue someone in danger
34. Interview workers about company complaints
35. Find errors in a financial account
36. Run a lawn mower
37. Study chemistry
38. Compose or arrange music
39. Show children how to play a game or sport
40. Present information before a group
41. Take inventory in a store
42. Trim hedges and shrubs
43. Use a microscope or other lab equipment
44. Sketch and draw pictures
45. Find out how others believe a problem can be solved
46. Conduct business by phone
47. Keep expense account records
48. Shelve books in a library
49. Read about the origin of the earth, sun, and stars
50. Read about the writing style of modern authors
51. Help people during emergencies
52. Work in a political campaign
53. Operate office machines
54. Repair damage to a tree after a storm
55. Study plant diseases
56. Select music to play for a local radio station
57. Take part in a small group discussion
58. Plan work for other people
59. Set up a bookkeeping system
60. Fix a toy
61. Measure chemicals in a test tube
62. Design a poster for an event
63. Work on a community improvement project

64. Explain legal rights to people
65. Make charts or graphs
66. Engrave lettering or designs on a trophy or plaque
67. Read about a new surgical procedure
68. Write reviews of Broadway plays
69. Give directions to visitors
70. Manage a small business
71. Count and sort money
72. Watch for forest fires

Level 2

1. Use a microscope or other lab equipment
2. Prepare drawings to illustrate a magazine story
3. Help a newcomer meet people
4. Conduct a meeting
5. Calculate the interest on a loan
6. Inspect products for defects
7. Read books or magazines about new scientific findings
8. Write short stories
9. Find out how others believe a problem can be solved
10. Manage a small business
11. Set up a bookkeeping system
12. Assemble a cabinet from written instructions
13. Measure chemicals in a test tube
14. Read about the writing style of modern authors
15. Help someone make an important decision
16. Present information before a group
17. Find errors in a financial account
18. Pack things into boxes
19. Read about a new surgical procedure
20. Design an ad for an event
21. Take part in a small group discussion
22. Interview workers about company complaints
23. Figure shipping costs for catalog orders
24. Build a picture frame
25. Attend the lecture of a well-known scientist
26. Compose or arrange music
27. Help friends with their problems
28. Develop new rules or policies
29. Take inventory in a store
30. Engrave lettering or designs on a plaque
31. Read about the earth, sun, and stars
32. Write a movie script
33. Teach people a new hobby
34. Hire a person for a job
35. Make charts or graphs
36. Shelve books in a library
37. Study the effects of vitamins on animals
38. Play jazz in a combo
39. Help rescue someone in danger
40. Plan work for other people
41. Keep expense account records
42. Build furniture
43. Learn how birds migrate
44. Write reviews of Broadway plays
45. Give directions to visitors
46. Conduct business by phone
47. Operate office machines
48. Cut and polish gemstones
49. Explore a science museum
50. Make creative photographs
51. Help settle an argument between friends
52. Explain legal rights to people
53. Plan a monthly budget
54. Design a bird feeder
55. Study plant diseases
56. Play in a band
57. Work on a community improvement project
58. Discuss a misleading ad with a salesperson
59. Sort, count, and store supplies
60. Trim hedges and shrubs
61. Observe and classify butterflies
62. Entertain others by telling jokes or stories
63. Help people during emergencies
64. Look for errors in the draft of a report
65. Prepare a budget
66. Help repair a television
67. Learn how the brain works
68. Sketch and draw pictures
69. Give a tour of an exhibit
70. Demonstrate a new product
71. Handle money transactions
72. Operate a lawn mower

Appendix C

UNIACT Scoring Procedures

The following UNIACT scoring procedures are currently used in most ACT programs. Minor deviations from these procedures may be found in program materials or by contacting the ACT Career Transitions Research Department. Scoring procedures for the Level 2 UNIACT-S in the WorkKeys Fit Assessment differ in significant respects (see ACT, 2008d).

Scoring

UNIACT scale raw scores are based on the item response average, determined by summing the response weights (see notes in Appendix D), dividing by the number of items answered, and multiplying this response average by the total number of items in the scale (12 items for UNIACT-S, 15 items for UNIACT-R). Scores are not computed if fewer than 10 items are answered on any scale.

UNIACT-S and UNIACT-R item orders are spiraled in the order shown below. UNIACT-S item order (72 items) is listed below, per scale. (Numbers refer to item order.) Item content is shown in Appendix B.

Science & Technology: 1, 7, 13, 19, 25, 31, 37, 43, 49, 55, 61, 67

Arts: 2, 8, 14, 20, 26, 32, 38, 44, 50, 56, 62, 68

Social Service: 3, 9, 15, 21, 27, 33, 39, 45, 51, 57, 63, 69

Administration & Sales: 4, 10, 16, 22, 28, 34, 40, 46, 52, 58, 64, 70

Business Operations: 5, 11, 17, 23, 29, 35, 41, 47, 53, 59, 65, 71

Technical: 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72

Raw scores are converted to cumulative percentages via the norm tables provided in Appendix D. (Norming samples are described in Chapter 3.) Appropriate norms are based on student-reported grade level. Cumulative percentages are converted to stanines based on the normal distribution. The stanine scale is a 9-point (1–9) score scale of approximately equal score units.

Linking Interests to Occupational Options

Research has repeatedly shown that interest inventory profile *level* for scales that use Likert-type responses (such as UNIACT) is in large part determined by response style (Prediger, 1998). To assure that the interpretation of UNIACT results is free from the effects of response style, results are reported on the basis of profile *shape*. Scaled scores are converted to World-of-Work Map regions based on the pattern of the person's scores. The six stanine scores are ranked and the three highest scores (the *3-letter code*) are used to determine World-of-Work Map regions. Table C.1 shows map regions corresponding to all possible 3-letter-code combinations.

Determination of 3-letter codes sometimes requires resolving tied scores. A complete list of decision rules used to resolve ties in UNIACT processing is available on request from the ACT Career Transitions Research Department.

The center of the World-of-Work Map is referred to as *Region 99*—a visual representation of a flat (undifferentiated) profile, or a conflicting (inconsistent) profile. A complete list of rules for defining Region 99 is available from the ACT Career Transitions Research Department.

Data/Ideas and People/Things Work Task Dimension Scores

Some readers may want to locate UNIACT scores directly on the Data/Ideas and People/Things Work Task Dimensions. Prediger (1981) provided formulas for obtaining data/ideas and people/things scores from 3-letter codes. As described by Prediger (1981), the weights in the formulas are based on the geometry of a hexagon, and thus correspond to Holland's theory. To use the formulas, scores 4, 2, and 1 are assigned to the scales that rank first, second, and third. Scales not in the 3-letter code are assigned a score of zero. The scores are then substituted for Holland types in the formulas:

$$\text{Data/Ideas} = 0.00(R) - 1.73(I) - 1.73(A) + 0.00(S) + 1.73(E) + 1.73(C)$$

$$\text{People/Things} = 2.00(R) + 1.00(I) - 1.00(A) - 2.00(S) - 1.00(E) + 1.00(C)$$

Although not used in operational processing, data/ideas and people/things scores can also be obtained by inserting the six UNIACT or other Holland-type scores directly in the above formulas (e.g., Leuwerke et al., 2004). Readers should note that the use of low-ranking scale scores in the calculation of dimension scores may simply add error, because low-ranking scores are not indicative of respondent preferences.

Table C.1
World-of-Work Map Regions Corresponding to 3-letter Codes

Type R		Type I		Type A		Type S		Type E		Type C	
Code	Region	Code	Region	Code	Region	Code	Region	Code	Region	Code	Region
RIA	8	IAS	10	ASE	12	SEC	2	ECR	4	CRI	6
RIS	7	IAE	9	ASC	11	SER	1	ECI	3	CRA	5
RIE	7	IAC	9	ASR	11	SEI	1	ECA	3	CRS	5
RIC	7	IAR	9	ASI	11	SEA	1	ECS	3	CRE	5
RAS	8	ISE	10	AEC	12	SCR	2	ERI	4	CIA	6
RAE	7	ISC	9	AER	11	SCI	1	ERA	3	CIS	5
RAC	7	ISR	9	AEI	11	SCA	1	ERS	3	CIE	5
RAI	8	ISA	10	AES	12	SCE	2	ERC	4	CIR	6
RSE	6	IEC	8	ACR	10	SRI	12	EIA	2	CAS	4
RSC	6	IER	8	ACI	10	SRA	12	EIS	2	CAE	4
RSI	7	IEA	9	ACS	11	SRE	1	EIC	3	CAR	5
RSA	7	IES	9	ACE	11	SRC	1	EIR	3	CAI	5
REC	5	ICR	7	ARI	9	SIA	11	EAS	1	CSE	3
REI	6	ICA	8	ARS	10	SIE	12	EAC	2	CSR	4
REA	6	ICS	8	ARE	10	SIC	12	EAR	2	CSI	4
RES	5	ICE	7	ARC	9	SIR	11	EAI	1	CSA	3
RCI	6	IRA	8	AIS	10	SAE	12	ESC	2	CER	4
RCA	6	IRS	8	AIE	10	SAC	12	ESR	2	CEI	4
RCS	6	IRE	8	AIC	10	SAR	12	ESI	2	CEA	4
RCE	5	IRC	7	AIR	9	SAI	11	ESA	1	CES	3

Appendix D

UNIACT Norms

Table D.1

Converting UNIACT-S Raw Scores to Cumulative Percentages: Grade 8

Raw Score	Science & Technology	Arts	Social Service	Administration & Sales	Business Operations	Technical
12	9	2	1	4	8	8
13	14	3	2	7	14	13
14	20	6	3	12	23	20
15	25	8	5	16	29	26
16	30	11	7	22	38	33
17	35	14	9	27	44	38
18	40	18	12	33	51	45
19	44	21	14	39	56	50
20	49	26	18	45	62	57
21	53	31	22	51	67	62
22	57	36	26	57	72	68
23	61	41	31	62	76	73
24	66	47	37	68	81	78
25	69	53	43	73	84	82
26	73	59	49	78	87	86
27	76	64	55	81	90	89
28	80	70	62	85	92	92
29	83	75	68	88	94	94
30	86	81	75	91	95	96
31	88	85	80	93	96	97
32	91	90	86	95	98	98
33	94	93	90	97	98	99
34	96	96	95	98	99	99
35	98	98	97	99	99	100
36	100	100	100	100	100	100

Note. These norms are nationally representative. Norms for Grade 8 are based on a sample of 273,964 8th graders tested during the academic year 2003–04 as part of the EXPLORE program. Each entry in this table is a cumulative percentage. This is the percentage of scores falling at or below a given raw score value (i.e., through the upper limit of the raw score interval). Cumulative percentages were not smoothed. To make the sample of students more representative of all U.S. students, the sample was weighted using national census data. Hence, it's unlikely that sampling bias affected the reported cumulative percentages. Raw scores are based on the following response weights: 3 = Like, 2 = Indifferent, 1 = Dislike. There are 12 items and responses per scale. Hence the maximum score is $12 \times 3 = 36$, and the minimum score is $12 \times 1 = 12$.

Table D.2

Converting UNIACT-R Raw Scores to Cumulative Percentages: Grade 8

Raw Score	Science & Technology	Arts	Social Service	Administration & Sales	Business Operations	Technical
15	8	1	1	3	7	6
16	13	2	2	5	12	9
17	18	4	3	9	19	15
18	22	5	4	12	25	19
19	27	8	5	16	31	24
20	31	10	6	19	37	29
21	36	13	8	24	43	35
22	39	15	10	28	48	39
23	43	19	12	33	54	45
24	47	22	14	38	58	49
25	51	26	17	43	63	55
26	54	30	19	48	67	59
27	58	34	23	53	71	64
28	62	38	26	57	74	68
29	65	43	30	63	78	73
30	69	48	34	67	81	76
31	72	53	39	72	84	80
32	75	58	44	76	87	83
33	78	63	49	79	89	87
34	80	67	54	82	91	89
35	83	72	59	86	92	92
36	85	76	64	88	94	93
37	88	81	70	91	95	95
38	89	84	74	93	96	96
39	92	88	80	95	97	97
40	93	91	84	96	98	98
41	95	94	89	97	98	99
42	96	96	92	98	99	99
43	98	98	96	99	99	100
44	99	99	98	99	100	100
45	100	100	100	100	100	100

Note. These norms are nationally representative. Norms for Grade 8 are based on a sample of 273,964 8th graders tested during the academic year 2003–04 as part of the EXPLORE program. Each entry in this table is a cumulative percentage. This is the percentage of scores falling at or below a given raw score value (i.e., through the upper limit of the raw score interval). Cumulative percentages were not smoothed. To make the sample of students more representative of all U.S. students, the sample was weighted using national census data. Hence, it's unlikely that sampling bias affected the reported cumulative percentages. Raw scores are based on the following response weights: 3 = Like, 2 = Indifferent, 1 = Dislike. There are 15 items and responses per scale. Hence the maximum score is $15 \times 3 = 45$, and the minimum score is $15 \times 1 = 15$.

Table D.3

Converting UNIACT-S Raw Scores to Cumulative Percentages: Grade 10

Raw Score	Science & Technology	Arts	Social Service	Administration & Sales	Business Operations	Technical
12	11	3	1	5	11	11
13	16	5	2	8	19	18
14	23	8	4	12	28	26
15	28	11	5	16	35	32
16	33	15	7	22	43	39
17	37	18	9	26	49	44
18	42	23	12	32	55	50
19	46	27	14	37	60	56
20	50	32	18	43	65	61
21	54	37	21	48	69	66
22	58	42	26	54	74	71
23	62	47	30	59	78	76
24	67	53	36	65	82	80
25	70	58	41	70	85	84
26	74	64	48	75	88	88
27	77	69	54	79	90	90
28	80	74	60	83	92	93
29	83	79	66	86	93	94
30	86	83	73	89	95	96
31	88	87	78	92	96	97
32	91	91	85	94	97	98
33	93	93	89	96	98	99
34	96	96	94	98	99	99
35	98	98	97	99	99	100
36	100	100	100	100	100	100

Note. These norms are nationally representative. Norms for Grade 10 are based on a sample of 407,325 10th graders tested during the academic year 2003–04 as part of the PLAN program. Each entry in this table is a cumulative percentage. This is the percentage of scores falling at or below a given raw score value (i.e., through the upper limit of the raw score interval). Cumulative percentages were not smoothed. To make the sample of students more representative of all U.S. students, the sample was weighted using national census data. Hence, it's unlikely that sampling bias affected the reported cumulative percentages. Raw scores are based on the following response weights: 3 = Like, 2 = Indifferent, 1 = Dislike. There are 12 items and responses per scale. Hence the maximum score is $12 \times 3 = 36$, and the minimum score is $12 \times 1 = 12$.

Table D.4

Converting UNIACT-R Raw Scores to Cumulative Percentages: Grade 10

Raw Score	Science & Technology	Arts	Social Service	Administration & Sales	Business Operations	Technical
15	10	2	1	4	10	8
16	15	3	2	6	16	13
17	21	6	3	9	24	20
18	25	8	4	12	30	25
19	30	11	5	16	36	31
20	34	13	7	19	42	35
21	38	17	8	24	47	41
22	42	20	10	28	52	45
23	46	24	12	32	57	50
24	49	27	14	36	61	55
25	53	31	16	41	65	59
26	56	35	19	46	68	63
27	60	40	22	51	72	68
28	63	44	25	55	75	72
29	67	49	29	60	79	76
30	70	53	33	65	82	79
31	73	58	38	69	85	83
32	76	63	42	73	87	85
33	79	67	47	77	89	88
34	81	71	52	81	91	90
35	84	75	57	84	92	92
36	86	79	62	87	94	94
37	88	83	68	89	95	95
38	90	86	72	92	96	96
39	92	89	78	94	97	98
40	93	91	82	95	98	98
41	95	94	87	97	98	99
42	96	96	91	98	99	99
43	98	98	95	99	99	100
44	99	99	98	99	100	100
45	100	100	100	100	100	100

Note. These norms are nationally representative. Norms for Grade 10 are based on a sample of 407,325 10th graders tested during the academic year 2003–04 as part of the PLAN program. Each entry in this table is a cumulative percentage. This is the percentage of scores falling at or below a given raw score value (i.e., through the upper limit of the raw score interval). Cumulative percentages were not smoothed. To make the sample of students more representative of all U.S. students, the sample was weighted using national census data. Hence, it's unlikely that sampling bias affected the reported cumulative percentages. Raw scores are based on the following response weights: 3 = Like, 2 = Indifferent, 1 = Dislike. There are 15 items and responses per scale. Hence the maximum score is $15 \times 3 = 45$, and the minimum score is $15 \times 1 = 15$.

Table D.5

Converting UNIACT-S Raw Scores to Cumulative Percentages and Standard Scores: Grade 12

Raw Score	Science & Technology		Arts		Social Service		Administration & Sales		Business Operations		Technical	
	CP	*T*	CP	*T*	CP	*T*	CP	*T*	CP	*T*	CP	*T*
12	5	34	2	29	0	20	2	29	6	34	7	35
13	9	37	5	34	1	27	4	32	11	38	12	38
14	13	39	8	36	1	27	6	34	18	41	18	41
15	17	40	11	38	2	29	9	37	24	43	22	42
16	21	42	14	39	3	31	13	39	30	45	28	44
17	25	43	18	41	4	32	16	40	35	46	33	46
18	29	44	22	42	5	34	20	42	41	48	38	47
19	33	46	26	44	7	35	24	43	45	49	43	48
20	38	47	31	45	9	37	30	45	51	50	49	50
21	42	48	35	46	11	38	35	46	55	51	54	51
22	46	49	40	47	14	39	41	48	60	53	60	53
23	51	50	45	49	18	41	46	49	65	54	64	54
24	56	52	52	51	23	43	53	51	71	56	70	55
25	60	53	57	52	28	44	59	52	75	57	75	57
26	65	54	62	53	33	46	65	54	79	58	80	58
27	69	55	67	54	40	47	70	55	82	59	84	60
28	73	56	72	56	47	49	75	57	85	60	87	61
29	77	57	77	57	53	51	79	58	88	62	90	63
30	81	59	82	59	61	53	83	60	90	63	93	65
31	84	60	86	61	68	55	87	61	92	64	95	66
32	88	62	89	62	76	57	91	63	94	66	97	69
33	91	63	92	64	82	59	93	65	96	68	98	71
34	94	66	96	68	89	62	96	68	97	69	99	73
35	97	69	98	71	94	66	98	71	99	73	99	73
36	100	80	100	80	100	80	100	80	100	80	100	80

Note. These norms are nationally representative. Norms for Grade 12 are based on a sample of 257,567 12th graders tested during the academic year 2003–04 as part of the ACT program. The first column of each entry is the cumulative percentage. This is the percentage of scores falling at or below a given raw score value (i.e., through the upper limit of the raw score interval). Cumulative percentages were not smoothed. To make the sample of students more representative of all U.S. students, the sample was weighted using national census data. Hence, it's unlikely that sampling bias affected the reported cumulative percentages. The second column of each entry is the standard score (*T* score) associated with the cumulative percentage. The *T* scores ($M = 50$, $SD = 10$) were derived through an area transformation. Raw scores are based on the following response weights: 3 = Like, 2 = Indifferent, 1 = Dislike. There are 12 items and responses per scale. Hence the maximum score is $12 \times 3 = 36$, and the minimum score is $12 \times 1 = 12$.

Table D.6

Converting UNIACT-R Raw Scores to Cumulative Percentages and Standard Scores: Grade 12

Raw Score	Science & Technology		Arts		Social Service		Administration & Sales		Business Operations		Technical	
	CP	*T*	CP	*T*	CP	*T*	CP	*T*	CP	*T*	CP	*T*
15	5	34	2	29	0	20	2	29	5	34	5	34
16	8	36	3	31	0	20	3	31	9	37	9	37
17	12	38	5	34	1	27	5	34	14	39	14	39
18	16	40	7	35	1	27	6	34	19	41	18	41
19	19	41	10	37	2	29	9	37	24	43	22	42
20	23	43	12	38	3	31	11	38	28	44	26	44
21	26	44	16	40	3	31	14	39	33	46	31	45
22	30	45	19	41	4	32	17	40	37	47	35	46
23	34	46	22	42	5	34	21	42	42	48	39	47
24	37	47	26	44	6	34	25	43	46	49	43	48
25	41	48	29	44	8	36	29	44	50	50	48	49
26	44	48	33	46	9	37	33	46	54	51	52	51
27	48	49	38	47	11	38	38	47	58	52	56	52
28	51	50	42	48	14	39	42	48	62	53	60	53
29	55	51	46	49	17	40	48	49	66	54	65	54
30	59	52	51	50	20	42	53	51	71	56	69	55
31	63	53	55	51	24	43	58	52	75	57	74	56
32	67	54	60	53	28	44	63	53	78	58	77	57
33	71	56	64	54	33	46	68	55	81	59	81	59
34	74	56	68	55	38	47	72	56	83	60	84	60
35	77	57	73	56	43	48	76	57	85	60	87	61
36	80	58	76	57	49	50	80	58	87	61	89	62
37	83	60	80	58	55	51	84	60	89	62	92	64
38	85	60	84	60	61	53	86	61	91	63	94	66
39	88	62	87	61	67	54	90	63	93	65	95	66
40	90	63	90	63	73	56	92	64	94	66	96	68
41	92	64	93	65	79	58	94	66	96	68	98	71
42	94	66	95	66	85	60	96	68	97	69	98	71
43	96	68	97	69	91	63	98	71	98	71	99	73
44	98	71	98	71	95	66	99	73	99	73	99	73
45	100	80	100	80	100	80	100	80	100	80	100	80

Note. These norms are nationally representative. Norms for Grade 12 are based on a sample of 257,567 12th graders tested during the academic year 2003–04 as part of the ACT program. The first column of each entry is the cumulative percentage. This is the percentage of scores falling at or below a given raw score value (i.e., through the upper limit of the raw score interval). Cumulative percentages were not smoothed. To make the sample of students more representative of all U.S. students, the sample was weighted using national census data. Hence, it's unlikely that sampling bias affected the reported cumulative percentages. The second column of each entry is the standard score (*T* score) associated with the cumulative percentage. The *T* scores ($M = 50$, $SD = 10$) were derived through an area transformation. Raw scores are based on the following response weights: 3 = Like, 2 = Indifferent, 1 = Dislike. There are 15 items and responses per scale. Hence the maximum score is $15 \times 3 = 45$, and the minimum score is $15 \times 1 = 15$.

Table D.7

Converting UNIACT-S Raw Scores to Cumulative Percentages: Adults

Raw Score	Science & Technology		Arts		Social Service		Administration & Sales		Business Operations		Technical	
	CP	*T*	CP	*T*	CP	*T*	CP	*T*	CP	*T*	CP	*T*
12	1	27	1	27	0	22	2	29	4	32	4	32
13	2	29	3	31	1	24	3	31	8	36	7	35
14	3	31	7	35	1	27	4	32	12	38	11	38
15	5	34	10	37	1	27	6	34	17	40	14	39
16	6	34	14	39	2	29	8	36	21	42	18	41
17	8	36	18	41	2	29	10	37	26	44	20	42
18	10	37	22	42	4	32	12	38	31	45	26	44
19	12	38	26	44	5	34	15	40	35	46	30	45
20	13	39	33	46	6	34	21	42	40	47	35	46
21	17	40	38	47	7	35	24	43	44	48	38	47
22	21	42	44	48	8	36	28	44	48	49	44	48
23	23	43	48	49	11	38	33	46	53	51	49	50
24	28	44	57	52	15	40	41	48	61	53	57	52
25	33	46	62	53	21	42	48	49	66	54	63	53
26	38	47	68	55	25	43	54	51	70	55	69	55
27	44	48	72	56	30	45	59	52	74	56	73	56
28	52	51	76	57	36	46	64	54	78	58	78	58
29	57	52	80	58	41	48	69	55	81	59	83	60
30	62	53	84	60	48	49	75	57	84	60	88	62
31	69	55	87	61	56	52	79	58	87	61	90	63
32	74	56	91	63	64	54	85	60	90	63	93	65
33	79	58	93	65	73	56	89	62	92	64	95	66
34	85	60	95	66	81	59	93	65	94	66	97	69
35	90	63	98	71	89	62	96	68	95	66	98	71
36	100	80	100	80	100	80	100	80	100	80	100	80

Note. These norms are nationally representative. They are based on a sample of 4,018 people age 21 or older tested during the academic year 2003–04 as part of the ACT program. The first column of each entry is the cumulative percentage. This is the percentage of scores falling at or below a given raw score value (i.e., through the upper limit of the raw score interval). Cumulative percentages were not smoothed. To make the sample more representative of all U.S. adults, the sample was weighted using national census data. Thus it is unlikely that sampling bias affected the reported cumulative percentages. The second column of each entry is the standard score (*T* score) associated with the cumulative percentage. The *T* scores ($M = 50$, $SD = 10$) were derived through an area transformation. Raw scores are based on the following response weights: 3 = Like, 2 = Indifferent, 1 = Dislike. There are 12 items and responses per scale. Hence the maximum score is $12 \times 3 = 36$, and the minimum score is $12 \times 1 = 12$.