INCREMENTAL VALIDITY OF EMPIRICALLY KEYED BIODATA SCALES OVER GMA AND THE FIVE FACTOR PERSONALITY CONSTRUCTS

MICHAEL K. MOUNT
Tippie College of Business
University of Iowa

L. A. WITT
Department of Management
University of New Orleans

MURRAY R. BARRICK
Broad Graduate College of Business
Michigan State University

The major purpose of this study was to determine whether empirically keyed, cross-validated biodata scales accounted for incremental variance over that accounted for by the five factor model (FFM) of personality and GMA predictors. A concurrent validation study was employed using 376 employees in a clerical job (222 in the developmental sample and 154 in the cross-validation sample). Results for the cross-validation sample provided support for the hypothesis that biodata predictors accounted for substantial incremental variance beyond that accounted for by the FFM predictors and GMA for 3 of the 4 criteria. Support was also found for the hypothesized zero-order correlations between GMA, FFM, and biodata predictors and the 4 criteria. Theoretical and practical implications are discussed.

General Mental Ability (GMA), five factor model (FFM) personality constructs, and biodata measures have been shown to be valid predictors of job performance in numerous settings and for a wide range of criterion types (e.g., Barge & Hough, 1988; Barrick & Mount, 1991; Hunter & Hunter, 1984; Reilly & Chao, 1982; Rothstein, Schmidt, Erwin, Owens, & Sparks, 1990; Schmitt, Gooding, Noe, & Kirsch, 1984). However, very little research has examined their joint use. The purpose of the present study is to examine the incremental validity of empirically keyed, cross-validated biodata scales over GMA and construct valid measures of the FFM personality constructs.

Research conducted over the past 18 to 20 years has shown that GMA is related to performance for virtually all jobs and that its validity increases as job complexity increases (e.g., Hunter & Hunter, 1984; Schmidt, Hunter, & Pearlman, 1981). Although GMA is related to job performance, the majority of variance in the criterion remains unaccounted for. Noncognitive predictors such as personality and biodata measures may account for some of the unexplained variance.

Research conducted over the past decade has shown that at least some personality measures are valid predictors of performance (e.g., Barrick & Mount, 1991; Salgado, 1997; Tett, Jackson, & Rothstein, 1991). Validities for the FFM constructs have been shown to differ depending on the nature of the job and the type of criteria, but each has been shown to be a valid predictor when linked to appropriate criteria. Of the FFM constructs, Conscientiousness has been shown to be the most generalizable predictor, with corrected correlations averaging about .30 (Mount & Barrick, 1995a).

Numerous studies have demonstrated that biodata measures can be highly valid predictors of both traditional criteria such as training success, performance ratings, and wages, and also such nontraditional criteria as adjustment, satisfaction, team performance, and safety performance (Hough & Paullin, 1994; Hunter & Hunter, 1984; Mumford & Owens, 1982; Stokes & Cooper, 1994). As with personality measures, validities for biodata measures differ across jobs and criterion types. On average, however, corrected correlations generally range from .30 to .40 (Hunter & Hunter, 1984; Reilly & Chao, 1982; Russell & Dean, 1994; Schmitt et al., 1984).

Whereas the construct validity of GMA and FFM predictors is well understood, this is not usually the case with biodata measures. One reason for this is that biodata scales have been shown to measure numerous constructs such as temperament, assessment of work conditions, values, preferences, skills, aptitudes, and abilities (Mitchell, 1994; Mumford & Stokes, 1991). Another reason is that biodata items are selected and weighted based on their empirical relationship to the criterion. Although items are often chosen based on a priori hypotheses guided by a well-defined framework of antecedent experiences and behaviors (e.g., Russell, Mattson, Devlin, & Atwater, 1988), the final items are selected and weighted based on their ability to discriminate the high and low performers in the initial validation sample. Observed correlations are cross-validated on a second, independent sample to assess the degree of sample specific results (e.g., Mitchell, 1994; Mumford & Owens, 1984).

This post hoc, empirical keying method is believed to have at least two strengths. First, it can identify subtle items for which the underlying construct is not apparent (Meehl, 1945). This has the advantage of

reducing the likelihood of faking. Further, the use of empirical keying methods may capture relationships that would be difficult to discover using traditional linear scoring methods used on most personality measures.

Post hoc, empirical keying methods have at least two drawbacks. First, measures developed using such methods may have limited generalizability because they are developed to predict a specific criterion for a specific job (It should be noted, however, that Rothstein et al., 1990, describe procedures to minimize this problem). Second, the post-hoc method does little to enhance understanding of the constructs being measured. As Mumford, Snell, and Reiter-Palmon (1994) pointed out, there is relatively little information in the literature about the nature of the psychological constructs that underlie the predictive power of biodata measures.

Joint Use of Biodata, GMA, and Personality

Several studies have examined biodata measures in conjunction with GMA. Allworth and Hesketh (1998) examined the incremental validity of three biodata scales (capacity to cope with change, self-efficacy for change, and past experience of change) over cognitive ability in predicting three aspects of performance: task, contextual, and adaptive. The biodata scales were developed using a construct-oriented item generation and scaling approach (Hough & Paullin, 1994). Cognitive ability was a better predictor of the criteria than the biodata change scales. However, the biodata scales accounted for significant unique variance in the criterion in one sample, especially when adaptive performance was the criterion. In another study, Dean and Russell (1998) investigated the relative contribution of biodata and GMA to the prediction of training performance using a large sample of FAA air traffic controllers. They found that the empirically keyed biodata scale was a better predictor than the cognitive ability measure, and that the biodata predictor accounted for significant incremental validity beyond that of the measure of GMA. Karas and West (1998) found that an empirically keyed, rationally developed biodata instrument demonstrated incremental validity over a test of cognitive ability for specific work performance domains as well as overall work performance. Mael and Ashforth (1995) demonstrated that biodata factors accounted for significant incremental validity over a cognitive aptitude measure in the prediction of attrition among Army recruits. Overall, these studies show that biodata measures can account for significant incremental variance in criteria over that accounted for by GMA for a variety of criterion types.

We were able to locate only two studies that examined the validities of biodata and personality jointly. Mael and Hirsch (1993) investigated the validity of several methods of keying biodata items in predicting the performance of U.S. military academy cadets. They keyed biodata items to predict an existing set of temperament scales, and then correlated these biodata-analogs with the criterion of interest. The second method directly keyed the biodata items against the performance criterion. Both biodata keys exhibited significant cross validities, but the directly keyed biodata scales exhibited significant incremental validity over the original temperament measures to an extent not exhibited by the biodata analogs. The important finding was that biodata items keyed directly to a performance measure added significant variance to that predicted by personality measures.

McManus and Kelly (1999) replicated and extended the study by Mael and Hirsch (1993). Whereas Mael and Hirsch focused on the similarity of biodata and personality measures, McManus and Kelly examined whether independent biodata and personality measures complement each other. They also examined personality measures in the context of the Big Five framework. They found that personality measures can provide significant incremental prediction of ratings of contextual performance of life insurance agents over biodata, and vice versa. Results for measures of sales task performance were less clear.

We were unable to locate any studies that examined the joint use of GMA, FFM personality predictors, and biodata scales.

Study Rationale

Building on the Mael and Hirsch (1993) and McManus and Kelly (1999) studies, we examined the joint use of GMA, biodata, and personality as predictors of four different criteria: quantity and quality of work, problem solving, interpersonal facilitation, and an aspect of performance of importance to organizations operating in a tight labor market, retention probability. In addition to including GMA as a predictor, we measured personality with construct valid measures of the FFM and measured biodata with scales that were developed using an inductive approach whereby items were rationally selected, empirically keyed, and cross-validated.

For both practical and theoretical reasons, we expected that biodata measures would account for incremental validity in the prediction of job performance beyond that accounted for by personality measures. First, from a practical perspective the content domains of biodata and personality overlap somewhat (Hough & Paullin, 1994; Mael, 1991), but they are not redundant. Biodata items are generally drawn from a larger

content domain than personality and GMA and, consequently, assess a wider range of personal attributes. For example, they may assess skills and aptitudes, which are likely to overlap minimally with personality and GMA items (Mumford & Stokes, 1991). Further, biodata items may measure characteristics of someone other than the individual respondent (e.g., parents, siblings, or friends) or may focus on behaviors that have actually taken place (i.e., historical performance relevant to criterion performance). In addition, background measures assess typical expressions of a measure rather than maximum expressions, they are generally believed to be less fakable than personality measures, and they also reflect an individual's interactions with the environment.

Further, from a theoretical perspective there is an important distinction between what FFM and GMA scales are intended to measure, and what biodata scales are intended to measure. Such differences could explain why biodata items could account for incremental validity over FFM personality predictors and GMA. FFM and GMA predictors are developed using a construct-oriented approach. That is, they are developed to measure a specific set of traits associated with a particular construct domain (e.g., Conscientiousness, Extraversion, etc.). They are not developed for the purpose of predicting a specific criterion for a particular job. On the other hand, biodata predictors are developed using primarily a criterion-related process, whereby items are selected based on their empirical relationship with a specific criterion for a particular job. For example, a biodata scale which we labeled "work habits" was developed in the present study to predict the quantity and quality of work criterion for a clerical job. The items that comprise this scale were selected and weighted explicitly based on their ability to differentiate individuals on this criterion dimension.

Viewed in this way, FFM and GMA measures are "internally constructed" measures, and biodata are "externally constructed" (Goldberg, 1972). Accordingly, the validity of FFM and GMA predictors would be expected to generalize to the extent that the predictor constructs assessed are relevant to criterion constructs in other situations. For example, the personality trait of conscientiousness is a valid predictor of overall performance in most jobs because it assesses traits such as efficiency, achievement, perseverance, and thoroughness, and these traits are associated with core task proficiencies that are common to most jobs. Similarly, the validity of GMA generalizes because it predicts core task proficiencies through its relationship to job knowledge which, in turn, is related to job performance (Hunter, 1986). On the other hand, the validity of biodata scales will generalize to the extent that the criterion constructs upon which the biodata scale was developed are also present in criteria used in other situations. Thus, we believed that bio-

data scales that are externally constructed to predict specific criteria for particular jobs will account for variance in these criteria beyond that accounted for by FFM constructs and GMA that are internally constructed to capture a particular predictor domain.

Hypotheses

There were two purposes of the study. The major purpose was to determine whether empirically keyed, cross-validated biodata scales would account for incremental variance in four performance criteria over-and-above the variance contributed by FFM personality constructs and GMA. We also examined the reverse question. That is, to what extent is additional variance accounted for by FFM constructs and GMA over the empirically keyed biodata scales. However, we believe the first approach is of greater interest because the FFM and GMA constructs provide a theoretically and practically meaningful foundation for nearly all selection batteries. A secondary purpose was to examine whether relevant FFM constructs, GMA, and biodata scales would predict four major performance components of a clerical job.

We postulated earlier that biodata scales that are developed using an externally constructed approach can account for specific variance in criteria beyond that accounted for by relevant FFM factors and GMA that are developed using a construct-oriented approach.

Hypothesis 1: Empirically keyed biodata scales will account for variance in the performance criteria beyond that accounted for by FFM personality constructs and GMA.

Results of a job analysis for the clerical job in this study suggested four dimensions of performance, namely quantity and quality of work, problem-solving performance, interpersonal facilitation, and retention probability. A separate biodata scale was developed to predict each of the four criteria. The derivation of the performance dimensions as well as the development of the biodata scales is described in the Method section. In the following paragraphs, we present the hypothesized relationships among the various predictors with each of the criteria.

The first performance component, quantity and quality of work, reflects the degree to which the employee can perform the core substantive tasks central to his or her job. As noted earlier, Conscientiousness (e.g., Barrick & Mount, 1991; Mount & Barrick, 1995b) and GMA (e.g., Hunter & Hunter, 1984; Schmidt et al., 1981) have been found to predict these core measures of job performance. For example, Mount and Barrick (1995a) reported a mean true-score correlation between Con-

scientiousness and measures of quality and effort of .26 and .29, respectively. Individuals who are dependable, achievement oriented, efficient, hardworking, and organized tend to produce higher quantity and quality of output than those who are not. Similarly, individuals with higher intelligence are more likely to produce higher quantity and quality of output. The biodata scale developed to predict this criterion tapped "work habits" and included items about preferences (e.g., about a job requiring certain clerical tasks), assessments of performance on certain clerical tasks (e.g., proofreading), attributions of success or failure on specific tasks, and performance history (e.g., at school or on previous jobs). We expected biodata items assessing work habits to be related to quantity and quality.

> *Hypothesis 2*: Employees with higher scores on Conscientiousness, GMA, and the biodata work habits scale will receive higher supervisory ratings for quantity and quality of performance.

The second criterion, problem-solving performance, measures performance in analyzing and solving problems that constitute barriers to goal achievement. We expected GMA to be related to this criterion because, in essence, GMA is a measure of an individual's general problem-solving skills. Hunter (1986) has demonstrated that GMA affects job performance indirectly through its effect on job knowledge. Job knowledge is fundamental to effective performance because people who understand the job better are more effective at solving job-related problems. Turning to the FFM constructs, Hough (1992) reported that employees rated high in creativity, which can be considered an aspect of problem-solving performance, tend to have higher scores on Extraversion (assessed with two constructs, affiliation and potency) and lower scores on Agreeableness, with mean correlations of .25, .21, and −.29, respectively. We also expected that employees high in Openness to Experience are better at solving problems because they are willing to consider new approaches and, consequently, are likely to develop unique solutions to old problems. The biodata scale developed to predict this criterion measured "problem-solving abilities" and included items about performance history (e.g., in school) and preferences (e.g., work assignments). We expected problem-solving abilities as assessed by biodata items to be related to problem-solving performance.

> *Hypothesis 3*: Employees with higher scores on Extraversion, Openness to Experience, GMA, and biodata assessed problem-solving abilities scales, and lower scores on Agreeableness will receive higher supervisor ratings of problem-solving performance.

The third criterion was interpersonal facilitation. A recent meta-analysis based on 11 studies ($n = 1,586$) of the FFM predicting performance in jobs involving interpersonal interactions shows that three FFM characteristics—Conscientiousness, Agreeableness, and Emotional Stability—are related to performance in jobs involving interpersonal relations (Mount, Barrick, & Stewart, 1998). The biodata scale developed to predict this criterion tapped "interpersonal relationship skills" and included items about preferences (e.g., for style of supervision), assessment of intra- and interpersonal skills (e.g., anger management), and history of relationships (e.g., levels of interaction with previous coworkers). We expected this scale to be related to interpersonal facilitation performance.

> *Hypothesis 4*: Employees with higher scores on Conscientiousness, Agreeableness, Emotional Stability and biodata assessed interpersonal relationship skills will receive higher supervisory ratings of interpersonal facilitation.

The fourth dimension of performance was retention probability, which refers to the likelihood that an employee will remain with the organization. This is an increasingly important criterion to many companies. Previous studies have shown that Conscientiousness and Emotional Stability are strongly, negatively related to intent to turnover (Barrick & Bretz, 1996) as well as to voluntary and involuntary turnover (Barrick & Mount, 1996; Barrick, Mount, & Strauss, 1993).

Evidence regarding the relationship of Extraversion to withdrawal behaviors such as absenteeism and turnover is less clear. For example, Judge, Martocchio, and Thoresen (1997) found that Extraversion was positively (and significantly) related to absence. Cortina, Doherty, and Schmitt (1992) found that Extraversion was positively (and significantly) correlated with voluntary turnover. On the other hand, Barrick and Mount (1996) found that Extraversion was negatively (and nonsignificantly) related to involuntary turnover.

There are two possible reasons for these apparently conflicting findings. First, the nature of the withdrawal behavior was different in each of the studies (e.g., absence, voluntary turnover, involuntary turnover), and the measure used in the present study differs from each of these. Second, the nature of the jobs investigated in each study differed. This is important because the direction of the relationship of extraversion to withdrawal behaviors may depend on whether extraversion is an important attribute for job success. In the present study, the job is a clerical position in a private sector organization where traits such as sociability, leadership, and ambition (components of Extraversion) are not relevant. Therefore, there would be a poor person–job fit for highly extraverted

individuals in this job and, consequently, we expected that Extraversion would be negatively correlated with retention probability.

The biodata scale developed to predict this criterion tapped perseverance in situations (subsequently referred to as "situation perseverance"). It included items about likely reasons for leaving a job, potentially conflicting job-life circumstances (e.g., proximity to the workplace), and preferences and values (e.g., keeping personal commitments). We expected situation perseverance as assessed by biodata items to be related to retention probability.

> *Hypothesis 5*: Employees low in Extraversion and high in Conscientiousness, Emotional Stability, and situation perseverance will receive higher supervisory ratings of retention probability.

Method

Participants and Procedures

A concurrent validation design was used to assess the relationships between GMA, personality, and biodata with the four criteria. Participants were 376 clerical employees in a private sector organization. They were divided into a developmental sample ($n = 222$) and a cross-validation sample ($n = 154$). Eight participants in the cross-validation sample had missing data. Consequently, all analyses in the cross-validation sample were based on responses from 146 participants. Participants in the cross-validation sample were primarily male (86%) and White (68%). Their average level of experience was 5.33 years ($SD = 4.85$). Characteristics of the developmental sample were very similar. Participants completed the Wonderlic Personnel Test (WPT), Form 5, the Personal Characteristics Inventory (PCI; Mount & Barrick, 1995b), and a 196-item biodata scale.

Measures and Analyses

The WPT is an ability test that is composed of three types of items: vocabulary, arithmetic reasoning, and spatial relations. According to Hunter (1989), the WPT is psychologically equivalent to other known measures of cognitive ability in the literature. For example, the correlation between the U. S. Employment Service GATB and the WPT is .75. When corrected for attenuation the correlation between the two measures is .90. The uncorrected correlation between the Wechsler Adult Intelligence Scale (WAIS), a well-established measure of intelligence for adolescents and adults, is .93, and approaches unity when corrected for

attenuation. These studies provide evidence that the WPT is a construct valid measure of cognitive ability. Across forms, test–retest reliabilities reported in the test manual range from .82 to .94. Alternate form reliabilities range from .73 to .95, while other measures of internal consistency (e.g., alpha, KR-20) range from .88 to .94 (see Wonderlic Personnel Test Manual, 1983).

The PCI assesses the FFM personality dimensions. It contains 120 items measuring the FFM constructs: 30 each for Conscientiousness ($\alpha = .74$) and Extraversion ($\alpha = .82$), and 20 each for Agreeableness ($\alpha = .77$), Emotional Stability ($\alpha = .82$), and Openness to Experience ($\alpha = .75$). Each item is rated on a 3-point Likert type scale (1 = *disagree* and 3 = *agree*). Test–retest reliability estimates over 4 months for the five dimensions range from .70 to .82 (Barrick & Mount, 1995b). The PCI scales also demonstrate adequate convergent validity and divergent validity with other measures of the FFM such as the NEO-PI (Costa & McCrae, 1992), the HPI (Hogan, 1986), and Goldberg's Adjective Checklist (Goldberg, 1992; See Mount & Barrick, 1995b, for more detailed information.)

The development of the four biodata scales proceeded in the following way. A job analysis was conducted to obtain a thorough understanding of the job. One of the authors interviewed 36 first-line supervisors and 12 second-level supervisors. He also interviewed the organization's chief executive regarding the most important aspects of the job. He then asked eight middle managers to review the comments made by the executive. In addition, he reviewed the performance contracts between supervisors and employees. These documents represented the key objectives and results expected of the job incumbents. The sum of this information indicated that there were four content domains: core task performance, problem solving, interpersonal facilitation, and retention probability.

Next, one of the authors and a consultant to the project wrote items to capture these four content domains. These items were reviewed by the other two authors. A list of 55 items was then reviewed by the eight mid-level managers, three human resource representatives who were familiar with the job, six first-line supervisors, and four job incumbents. Some items were deleted, and other items were rewritten. In all, 52 criterion items representing four performance dimensions resulted from this process, including one overall job performance item.

Principal components analyses with varimax rotation was conducted on ratings made by the immediate supervisor ($n = 56$) for the 376 participants in the combined developmental and cross validation samples. Four orthogonal factors were identified. Four items were eliminated because they did not cleanly load on a single factor, resulting in a total of 48 items. Examples of representative items for each factor are provided below.

First was the quantity and quality of work. This scale ($\alpha = .96$) consisted of 22 items (e.g., "[employee name] consistently produces a high quantity and quality of work"). Second was problem-solving performance ($\alpha = .93$), which consisted of 11 items (e.g., "[employee name] is quick to implement changes in processes and procedures"). Third was interpersonal facilitation ($\alpha = .92$), which consisted of 11 items (e.g., "[employee name] maintains positive attitude in dealing with customers"). Fourth was retention probability ($\alpha = .65$), which consisted of four items (e.g., "[employee name] indicated an intention to leave or to quit his/her job"). Items on the first three scales were responded to on a 5-point scale ranging from 1 = *weak* (bottom 10%) to 5 = *best* (top 10%). Items on the fourth scale were responded to on a 6-point scale ranging from 1 = *never* to 6 = *constantly*. The average absolute value of the correlations between factors was .08. Each employee was rated by his or her immediate supervisor on the performance items.

A separate biodata scale was developed to predict each criterion. Biodata items were drawn from a pool of items developed by a consultant to this project and from relevant pre-existing scales (e.g., delay of gratification; Ray & Najman, 1986). The consultant had developed these items based on over 15 years of test validation research involving biodata items. Mael (1991) points out that virtually any event or behavior that has actually taken place, whether it reflects capabilities that existed earlier or itself is a shaper of subsequent behavior, is appropriate subject matter for biodata items. Thus, the only attribute that defines a biodata item is that it reflects a current or past part of the person's life history. The attributes of the biodata items used in the present study covered many of the attribute categories discussed by Mael (1991), for example, historical, external, objective, first-hand, and so forth. No attempt was made to restrict the biodata items to a particular domain.

Items were rationally assigned to the relevant criterion based on their conceptual linkage to the underlying performance construct(s) measured. The research version of the instrument consisted of 196 items, which was administered to all participants. In the Appendix we present three parallel items for each of the biodata scale to illustrate the content of each scale.[1]

A cross-validity version of the biodata instrument to be used to test the hypotheses was developed by empirically scoring the data from the developmental sample ($n = 222$). For each item, correlations were computed between each response option and the continuous criterion factor

---

[1] A proprietary agreement prevents us from publishing the actual items. Contact the first author to obtain information about the commercial availability of the biodata items.

scores. Item responses with correlation coefficients that were statistically significant at the .01 level were converted into signed integer scale scores. Summed predictor composites corresponding to the four criterion factors (quantity and quality of work, problem-solving, interpersonal facilitation, and retention) were computed. After the empirically derived scoring weights were determined, a rational calibration was performed to ensure that the scoring weights were interpretable. For example, if four of the five scale points for an item strongly indicated a linear relationship with the criterion, but one of the scale points did not, the scoring for this scale point was adjusted to reflect the linear trend. This procedure was used on a limited number of items to remove anomalous fluctuations in item scales that result from sampling error, and to thereby better capture the functional relationship between each item and each criterion measure.

This process yielded a 138-item biodata instrument. The work habits scale consisted of 28 items ($\alpha = .54$), the problem-solving abilities scale 40 items ($\alpha = .81$), the interpersonal relations skills 38 items ($\alpha = .64$), and the situation perseverance scale 40 items ($\alpha = .69$). Not surprisingly, the alphas for these scales are somewhat lower than for FFM and GMA predictors. As empirically derived biodata scales are constructed to predict an external criterion, they may be multidimensional in nature. Therefore, they would be expected to have lower internal consistency reliabilities than scales developed using an internal, construct-oriented approach (FFM and GMA predictors), where the focus is on the homogeneity of the item content. The primary concern with empirically keyed biodata scales is whether they predict at an appropriate level in an independent sample, rather than whether the content of the scales is homogeneous.

Results

Correlations among the five personality factors, the WPT, the four biodata predictors, and the four criteria are shown in Table 1 for the developmental and cross-validation groups. The hypotheses were tested using the data from the cross-validation sample ($n = 146$).

Hierarchical regression analyses were conducted for each dependent variable. Results are shown in Table 2. Because this is a concurrent validation study and the participants are job incumbents, it is possible that their experience on the job influenced their responses to the biodata items. In order to minimize this potential confounding effect, we controlled for incumbent experience in all regression analyses. Tenure of the employee was entered in the first step, GMA was entered in the

TABLE 1

Correlations Among Predictor and Criterion Measures

	Developmental		Cross-validation		1	2	3	4	5	6	7	8	9	10	11	12	13	14
	$\bar{X}_1$	SD	$\bar{X}_2$	SD														
FFM scales																		
1. Conscientiousness	81.19	5.83	81.60	5.77	—	.02	.45	.45	.24	.19	.26	.25	.14	.27	.21	.16	.01	.14
2. Extraversion	67.15	9.51	67.77	8.86	.18	—	.02	.03	.43	.09	-.36	.36	.03	-.15	-.23	.14	-.04	-.10
3. Agreeableness	52.40	5.29	52.70	5.56	.25	.15	—	.44	.10	.12	.12	.04	.29	.21	.00	.02	.18	.05
4. Emotional stability	46.90	7.73	47.27	7.51	.42	.15	.31	—	.25	.09	.10	.24	.15	.23	.04	.10	.02	.08
5. Openness	48.42	6.49	48.36	5.99	.42	.35	.19	.35	—	.29	-.09	.47	.14	.02	-.06	.25	-.03	.01
6. GMA	19.70	6.19	20.08	6.22	.24	.20	.00	.07	.42	—	.19	.47	.32	.08	.10	.29	.14	.02
Biodata scales																		
7. Work habits	49.52	13.22	50.15	9.98	.28	-.22	.01	.03	.02	.18	—	.11	.18	.34	.75	.02	.08	.18
8. Problem-solving abilities	49.64	12.26	50.16	10.22	.43	.48	.07	.35	.54	.44	.22	—	.32	.25	.05	.67	.09	.12
9. Interpersonal relationship skills	49.12	12.53	49.87	10.00	.35	.13	.17	.39	.34	.30	.42	.52	—	.36	.04	.12	.68	.13
10. Situation perseverance	50.33	11.73	49.86	10.01	.13	-.12	.13	.24	.14	.00	.38	.15	.43	—	.16	.18	.15	.70
Criterion scales																		
11. Quantity and quality	.03	1.03	-0.03	1.00	.29	-.10	.09	.04	.03	.14	.37	.14	.12	.17	—	.02	.02	.04
12. Problem solving	.03	1.03	-0.01	1.02	.05	.30	-.11	.00	.24	.22	.01	.33	.06	-.15	.04	—	.03	.11
13. Interpersonal facilitation	.01	1.07	0.01	0.88	.12	-.06	.17	.08	-.03	.02	.19	.05	.28	.11	.03	-.12	—	.01
14. Retention probability	-.02	1.04	0.03	0.92	.11	-.18	-.06	.11	.07	.04	.18	.06	.14	.34	-.00	-.17	-.15	—

Note: Results above the diagonal are for the developmental group ($n = 222$); those below the diagonal are for the cross validation group ($n = 146$).
Correlations below the diagonal, $r \geq .13$, $p < .05$, two-tailed.
Correlations above the diagonal, $r > .15$, $p < .05$, two-tailed.

TABLE 2

Results of Hierarchical Regression Analyses

Hierarchical step	Ind. var.	Quantity/quality		Problem solving		Interpersonal relationships		Retention	
		R^2	ΔR^2	R^2	ΔR^2	R^2	ΔR^2	R^2	ΔR^2
1.	Tenure	.001		.008		.001		.000	
2.	GMA	.021	.020†	.053*	.047**	.002	.001	.002	.002
3.	FFM predictors	.136**	.134**	.168***	.115***	.051	.050	.080	.078*
	Conscientiousness								
	Extraversion								
	Agreeableness								
	Openness								
	Emotional stability								
4.	Relevant biodata	.193**	.057**	.188**	.020†	.123*	.072**	.167**	.087**

Note: †$p < .10$ *$p < .05$ **$p < .01$

second step, the block of FFM predictors was entered in the third step, and the relevant biodata predictor was entered in the fourth step.

Results for the first dependent measure, quantity/quality, showed that after controlling for the effects of tenure on the job (which were negligible), GMA accounted for marginally significant variance ($\Delta R^2 = .02$, $p < .10$). The block of FFM predictors accounted for substantial incremental validity over GMA and tenure ($\Delta R^2 = .134$, $p < .01$). The relevant biodata predictor, work habits, accounted for significant incremental variance ($\Delta R^2 = .057$, $p < .01$) beyond that accounted for by the tenure, GMA, and the FFM predictors. Collectively, the four sets of predictors accounted for approximately 19% of the variance in the criterion (15% when adjusted for shrinkage).

Results for the problem-solving criterion revealed that GMA accounted for significant variance in the criterion ($\Delta R^2 = .047$, $p < .01$), after controlling for the effects of tenure (which were negligible). The block of FFM predictors accounted for significant variance over that accounted for by tenure and GMA ($\Delta R^2 = .115$, $p < .01$). The relevant biodata scale, problem-solving abilities, accounted for marginally significant incremental validity over tenure, GMA, and the FFM predictors ($\Delta R^2 = .02$, $p = .07$). Collectively, the four sets of predictors accounted for approximately 19% of the variability in the criterion (14% when adjusted for shrinkage).

Results for the interpersonal facilitation criterion showed that the only predictor that accounted for significant incremental variance over other predictors was the biodata scale, interpersonal relationship skills ($\Delta R^2 = .072$, $p < .01$). Together, the four sets of predictors accounted for about 12% of the variance in the criterion (7% when adjusted for shrinkage).

Results for the retention probability scale showed that the block of FFM predictors accounted for significant incremental validity over GMA and tenure ($\Delta R^2 = .078$, $p < .05$). And, the relevant biodata predictor accounted for significant incremental variance over that accounted for by tenure, GMA, and FFM predictors. The four sets of predictors accounted for 17% of the variance in the criterion (12% when adjusted for shrinkage).

Overall, the results of the hierarchical regression analyses provided strong support for Hypothesis 1. The empirically keyed biodata scales accounted for significant incremental variance over FFM and GMA measures for three criteria (and was marginally significant ($p = .07$) for the fourth criterion).

Results for Hypotheses 2–5 are presented next. Hypothesis 2 was confirmed. For the quantity and quality of work criterion, Conscientiousness ($r = .28$; 90% CI is $.15 \leq .28 \leq .41$), the work habits biodata

scale ($r = .37$; 90% CI is $.25 \leq .37 \leq .49$), and GMA ($r = .14$; 90% CI is $.01 \leq .14 \leq .27$) were valid predictors.

Hypothesis 3, pertaining to the problem-solving criterion was partially confirmed. Extraversion ($r = .30$, 90% CI is $.18 \leq .30 \leq .42$), Openness ($r = .24$, 90% CI is $.16 \leq .24 \leq .32$), GMA ($r = .20$; 90% CI is $.07 \leq .20 \leq .33$), and the problem-solving skills biodata scale ($r = .31$, 90% CI is $.19 \leq .31 \leq .43$) were valid predictors. Contrary to expectations, Agreeableness was not ($r = -.11$, 90% CI is $-.25 \leq -.11 \leq .03$).

Hypothesis 4 pertaining to the interpersonal facilitation was partially confirmed. Conscientiousness ($r = .16$, 90% CI is $.03 \leq .16 \leq .27$), Agreeableness ($r = .17$, 90% CI is $.04 \leq .17 \leq .28$) and the interpersonal relationships biodata scale ($r = .26$, 90% CI is $.13 \leq .26 \leq .39$) were valid predictors. Contrary to expectations, Emotional Stability ($r = .00$) was not.

Hypothesis 5 pertaining to the retention probability criterion was partially confirmed. Extraversion ($r = -.18$, 90% CI is $-.31 \leq -.18 \leq -.05$) was negatively related and the situation perseverance biodata scale ($r = .34$, 90% CI is $.22 \leq .34 \leq .46$) was positively related. However, Conscientiousness ($r = .08$, 90% CI is $-.06 \leq .08 \leq .22$) and Emotional Stability ($r = .11$, 90% CI is $-.03 \leq .11 \leq .25$) were not valid predictors, although both were in the predicted direction.

Inspection of the correlations among the FFM, GMA, and biodata measures provides information regarding the nature of the constructs underlying the biodata predictors. It can be seen that each of the biodata scales correlates significantly with one or more of the FFM constructs. For example, the work habits biodata scale, which reflects the core task proficiencies of the job (i.e., quantity and quality of performance), was found to be related to Conscientiousness, Extraversion (negatively), and GMA ($r = .23$, $-.22$, and $.20$, respectively). The problem-solving abilities scale was highly correlated with all of the FFM constructs and GMA except Agreeableness. The interpersonal relationship skills scale was correlated with Conscientiousness, Agreeableness, and Emotional Stability ($r = .33$, $.17$, and $.39$, respectively). Finally, situation perseverance was correlated only with Emotional Stability ($r = .24$). Thus, it is apparent that each of the biodata scales overlap with FFM constructs and GMA, but they are not redundant constructs.

Table 1 also shows the validity of each biodata scale: work habits $r = .37$; problem-solving $r = .33$; interpersonal $r = .28$; situation perseverance $r = .34$. The shrinkage that occurs from the developmental to the cross-validation correlations is due to the fact that the correlations in the developmental sample are inflated because sample specific variance is captured in the relationships. Nonetheless, the validities obtained for

the four scales in the cross validation group are relatively high and are both practically and statistically significant. The magnitude of the validities is also consistent with that reported in meta-analyses of biodata measures (e.g., Hunter & Hunter, 1984, Reilly & Chao, 1982; Russell & Dean, 1994; Schmitt et al., 1984).

Discussion

It is now widely accepted that personality measures, GMA, and biodata scales are valid predictors of performance when matched to appropriate criteria. The question that the present study addressed is whether empirically keyed biodata scales add incremental validity over construct valid measures of the FFM and GMA. This issue is particularly important in the case of personality and biodata predictors, because it is widely perceived that the content domains overlap. From a practical perspective, the question that this research addresses is whether the extent of overlap among the personality, GMA, and biodata domains is so great that there is no incremental gain in the joint use of biodata with the other two types of predictors. From a theoretical perspective, this question can be framed in terms of whether externally constructed measures that focused on a specific criterion space are redundant with internally constructed measures that focused on the predictor space.

The present study extends the results of two prior studies that investigated the joint use of biodata and personality. Mael and Hirsch (1993) compared two methods of keying biodata items and found that both predicted the criteria of interest. However, the directly keyed biodata scales exhibited significant incremental validity over the original temperament measures to an extent not exhibited by the biodata analogs. Whereas Mael and Hirsch focused on the similarity of biodata and personality measures, McManus and Kelly (1999) examined whether independent biodata and personality measures complement each other. They found that personality measures in the context of the Big Five framework predicted their 2-item measure of contextual performance over biodata, and vice versa. Results for their 3-item measure of sales task performance were less clear.

Our study extends the findings of the two previous studies in five ways. First, we examined the incremental validity of biodata scales that have been developed using an inductive approach whereby items were rationally selected, empirically keyed, and cross-validated. Second, we examined these issues using construct valid measures of the five factor model (FFM) personality constructs (Conscientiousness, Extraversion, Agreeableness, Emotional Stability, and Openness to Experience). In the aforementioned studies, there was no evidence that the personality

scales were construct valid measures of the FFM. For example, Mael and Hirsch (1993) measured personality through the ABLE, which is a carefully constructed instrument, but is not based on the FFM. McManus and Kelly (1999) developed personality items and had subject matter experts assign them to the FFM. They pointed out that one possible reason for the lack of prediction for their Conscientiousness measure is that it may not be a construct valid measure. Third, we examined the incremental validity of biodata measures over an established predictor of performance, general mental ability (GMA), whereas previous studies did not. Fourth, we assessed the generalizability of results across four relatively distinct criterion types. Fifth, we controlled for the potential confounding effects of incumbent job experience.

The major finding was that biodata predictors can account for incremental variance in criteria beyond that accounted for by incumbent experience on the job, relevant FFM constructs, and GMA. These findings were true for all four criteria, although the variance accounted for by the problem-solving biodata scale was marginally significant ($p = .07$). The amount of the incremental variance accounted for by biodata scales was 5% or more for three of the dependent measures. This is especially impressive given that the effects of incumbent experience (tenure), and two well established sets of predictors GMA and the FFM were controlled for. When examined in the reverse way, we found that substantially less incremental validity was accounted for by the relevant FFM and GMA predictors over the relevant biodata scales.

Based on validities reported in previous studies, it is known that a predictor composite consisting of the FFM and GMA measures will account for less than half of the variance in the criterion (Barrick & Mount, 1991; Hunter & Hunter, 1984). The process used in this study to develop biodata scales was based on both conceptual and empirical linkages of items with a criterion. Results showed that biodata scales developed in this way can directly tap into at least some aspects of the criterion that are not assessed by the FFM and GMA predictors. Both GMA and Conscientiousness are known to predict a broad set of behaviors associated with core task proficiencies. The present results show that biodata scales accounted for variance in these task proficiencies (e.g., quality and quantity of work criterion) that was not accounted for by the FFM constructs and GMA. Although the results showed that internally constructed measures such as FFM and GMA constructs can account for significant variance in three of the four diverse criteria, it is apparent that better prediction can occur when predictor constructs are used that are developed specifically to measure the particular criterion. These results are important both practically and theoretically, as they indicate that the use of both internally developed measures designed to tap into relevant predictor

constructs and externally developed measures designed to tap into relevant criterion constructs can maximize selection validity.

Although researchers have acknowledged that the domains of personality and biodata overlap, the present results clearly show that they do not necessarily assess redundant constructs. However, a question about which relatively little is known is what constructs are measured by biodata scales. Our results show that the biodata scales in the present study assess multiple FFM personality constructs. The work habits scale correlated .20 or greater with Conscientiousness, Extraversion (negatively), and GMA. The problem-solving abilities scale correlated greater than .35 with all of the predictors but Agreeableness. The interpersonal relationship scale correlated .30 or greater with three of the predictors (Conscientiousness, Agreeableness, and Openness). The situation perseverance scale correlated .24 with emotional stability.

However, the fact that substantial variance was accounted for in three of the four criteria by relevant biodata scales over the FFM and GMA indicates that something in addition to Conscientiousness, Extraversion, Emotional Stability, Openness, Agreeableness, and cognitive ability are being measured by the biodata scales. But if these constructs are not being measured, then which ones are? The simplest explanation is that biodata scales assess those constructs that are present in the relevant criterion measure. That is, the work habits scale directly assessed components of quantity and quality of work, the problem-solving biodata scale directly assessed components of problem-solving skills, and so on. As discussed earlier, the drawback of empirically keyed scales is that the results generalize only when the criterion is relevant to other jobs and organizations (Rothstein et al., 1990). On the other hand, the advantage of FFM constructs is that their content is well understood and their validities have been shown to generalize across organizations when matched to appropriate criteria. This suggests that there are advantages to using both types of predictors jointly.

One possible limitation of the study pertains to the scoring procedures we used for the biodata scales. We used a procedure that combined rational and empirical approaches. That is, biodata items were selected initially from a pool of items based on judgments about their relevance to the criterion constructs. The relationship of the items to the criteria were determined empirically, and cross-validated in an independent sample. We believe this approach was effective in developing useful biodata predictors. Nonetheless it is possible that different results would have been obtained if a different procedure had been used.

Another potential limitation is that because this is a concurrent validation study, and the participants are job incumbents, it is possible that their experience on the job influences their responses to the biodata

items. For this reason we included incumbent experience as the first step in the regression analysis. Results revealed that the biodata scales accounted for substantial incremental variance in criterion measures after controlling for participants' experience on the job. From these analyses, we conclude that incumbent job experience does not influence the relationship between the biodata predictors and the criteria. These findings reduce the concerns about the generalizability of the findings to applicant settings.

In an earlier version of this manuscript, concerns were expressed about the degree of similarity between the biodata items, especially those for the work habits scale, and the criterion items, especially those for the quantity and quality of work scale. To address this issue we provided the reviewers and the editor with 48 representative biodata items (12 per scale) and all 48 criterion items. The consensus was that although there was some overlap between the two sets of items (as would be expected), it was apparent that the biodata items were not merely self-reports of the criteria.

A related concern was what makes an item uniquely a biodata item and what causes biodata items (scales) to be predictive. For example, biodata items could predict better than FFM and GMA predictors because they measure different attributes. Or, they could predict better because of the technology of biodata. That is, they may measure the same constructs as FFM and biodata predictors but the empirical keying process (technology) leads to better prediction.[2] Our study was not designed to address these questions; nonetheless, we believe that they are important and are fruitful areas for future research.

In conclusion, our findings show that empirically keyed, cross-validated biodata scales account for substantial variance beyond that accounted for by construct valid measures of the FFM and GMA. Results also show that the amount of criterion variance accounted for by the joint use of GMA, FFM, and biodata predictors is substantial. The multiple correlation for three of the four criteria was approximately .40 or greater (uncorrected for measurement error or range restriction), which compares very favorably to the validity of other selection methods. Hollenbeck and Whitener (1988) suggested that the validity of personality predictors should be evaluated together with GMA. Extending that argument, we found that a hybrid selection battery consisting of GMA, relevant FFM constructs, and biodata scales can increase validity. Such an approach can accomplish the dual goals of enhancing understanding through the use of GMA and FFM constructs whose content is

---

[2] We thank an anonymous reviewer for bringing this to our attention.

well known, while at the same time maximizing the level of prediction through the use of empirically keyed biodata scales.

REFERENCES

Allworth EG, Hesketh B. (1998, April). *Generalizability of construct-oriented biodata scales in predicting adaptive performance*. Paper presented at the 13th Annual Conference of the Society for Industrial and Organizational Psychology, Dallas, TX.

Barge BN, Hough LM. (1988). Utility of biographical data for predicting job performance. In Hough LM (Ed.), *Utility of temperament, biodata and interest assessment for predicting job performance: A review and integration of the literature (ARI Research Note RN 88-02)*. Alexandria, VA: U.S. Army Institute for the Behavioral and Social Sciences.

Barrick MR, Bretz RD Jr. (1996, April). *Assessing "fit" from a team perspective: A policy capturing approach*. Paper presented at the 11th Annual Conference of the Society of Industrial and Organizational Psychology, San Diego, CA.

Barrick MR, Mount MK. (1991). *The Big Five personality dimensions and job performance: A meta-analysis*. PERSONNEL PSYCHOLOGY, *44*, 1–26.

Barrick MR, Mount MK. (1996). Effects of impression management and self-deception on the predictive validity of personality constructs. *Journal of Applied Psychology, 81*, 261–272.

Barrick MR, Mount MK, Strauss JP. (1993). Conscientiousness and performance of sales representatives: Test of mediating effects of goal setting. *Journal of Applied Psychology, 78*, 715–722.

Cortina TA, Doherty ML, Schmitt N. (1992). The "Big Five" personality factors in the IPI and MMPI: Predictors of police performance. PERSONNEL PSYCHOLOGY, *45*, 119–140.

Costa PT Jr, McCrae RR. (1992). *NEO PI-R Professional Manual*. Odessa, FL: Psychological Assessment Resources, Inc.

Dean MA, Russell CJ. (1998, April). *A comparison of g and biodata criterion-related validity in a sample of air traffic controllers*. Paper presented at the 13th Annual Conference of the Society for Industrial and Organizational Psychology, Dallas, TX.

Goldberg LR. (1972). Parameters of personality inventory construction and utilization: A comparison of prediction strategies and tactics. *Multivariate Behavioral Research Methods, 2*, 3–59.

Goldberg LR. (1992). The development of markers for the Big Five factor structure. *Psychological Assessment, 4*, 26–42.

Hogan R. (1986). *Manual for the Hogan Personality Inventory*. Minneapolis, MN: National Computer Systems.

Hollenbeck JR, Whitener EM. (1988). Reclaiming personality traits for personnel selection: Self-esteem as an illustrative case. *Journal of Management, 14*, 81–91.

Hough LM. (1992). The "Big Five" personality variables—construct confusion: Description versus prediction. *Human Performance, 5*, 139–155.

Hough LM, Paullin C. (1994). Construct-oriented scale construction. In Stokes GS, Mumford MD, Owens WA (Eds.), *Biodata handbook* (pp. 109–146). Palo Alto, CA: Consulting Psychologists Press, Inc.

Hunter JE. (1986). Cognitive ability, cognitive aptitudes, job knowledge, and job performance. *Journal of Vocational Behavior, 29*, 340–362.

Hunter JE. (1989). *The Wonderlic Personnel Test as a predictor of training success and job performance*. Libertyville, IL: Wonderlic Personnel Test, Inc.

Hunter JE, Hunter RF. (1984). Validity and utility of alternate predictors of job perfor-
    mance. *Psychological Bulletin, 96*, 72–98.
Judge TA, Martocchio JJ, Thoresen CJ. (1997). Five factor model of personality and
    employee absence. *Journal of Applied Psychology, 82*, 745–755.
Karas M, West JA. (1998, April). *An explicit, construct-oriented approach to the development
    of rational-empirical biodata*. Paper presented at the 13th Annual Conference of the
    Society for Industrial and Organizational Psychology, Dallas, TX.
Mael FA. (1991). A conceptual rationale for the domain and attributes of biodata items.
    PERSONNEL PSYCHOLOGY, *44*, 763–792.
Mael FA, Ashforth BE. (1995). Loyal from day one: Biodata, organizational identification,
    and turnover among newcomers. PERSONNEL PSYCHOLOGY, *48*, 309–333.
Mael FA, Hirsch AC. (1993). Rainforest empiricism and quasi-rationality: Two ap-
    proaches to objective biodata. PERSONNEL PSYCHOLOGY, *46*, 719–738.
McMannus MA, Kelly ML. (1999). Personality measures and biodata: Evidence regard-
    ing their incremental predictive validity in the life insurance industry. PERSONNEL
    PSYCHOLOGY, *52*, 137–148.
Meehl PE. (1945). The dynamics of "structured" personality tests. *Journal of Clinical
    Psychology, 1*, 296–303.
Mitchell TW. (1994). The utility of biodata. In Stokes GS, Mumford MD, Owens WA
    (Eds.), *Biodata handbook* (pp. 485–516). Palo Alto, CA: Consulting Psychologists
    Press, Inc.
Mount MK, Barrick MR. (1995a). The Big Five personality dimensions: Implications for
    research and practice in human resources management. *Research in Personnel and
    Human Resource Management, 13*, 152–200.
Mount MK, Barrick MR. (1995b). *The Revised Personal Characteristics Manual*. Unpub-
    lished technical report.
Mount MK, Barrick MR, Stewart GL. (1998). Five factor model of personality and perfor-
    mance in jobs involving interpersonal interactions. *Human Performance, 11*, 145–
    165.
Mumford MD, Owens WA. (1982). Life history and vocational interests. *Journal of Voca-
    tional Behavior, 21*, 330–348.
Mumford MD, Owens WA. (1984). Individuality in a developmental context: Some em-
    pirical and theoretical considerations. *Human Relations, 27*, 84–108
Mumford MD, Snell AF, Reiter-Palmon R. (1994). Background data and development:
    Structural issues in the application of life history measures. In Stokes GS, Mumford
    MD, Owens WA (Eds.), *Biodata handbook* (pp. 555–582). Palo Alto, CA: Consult-
    ing Psychologists Press, Inc.
Mumford MD, Stokes GS. (1991). Developmental determinants of individual action: The-
    ory and practice in the application of background data. In Dunnette MD, Hough
    LM (Eds.), *Handbook of industrial and organizational psychology, 2nd ed*. (Vol. 3,
    pp. 1–78). Palo Alto, CA: Consulting Psychologists Press, Inc.
Ray JJ, Najman NJ. (1986). The generalizability of deferment of gratification. *Journal of
    Social Psychology, 126*, 117–119.
Reilly RR, Chao GT. (1982). Validity and fairness of some alternative employee selection
    procedures. PERSONNEL PSYCHOLOGY, *35*, 1–62.
Rothstein HR, Schmidt FL, Erwin FW, Owens WA, Sparks CP. (1990). Biographical data
    in employment selection: Can validities be made generalizable? *Journal of Applied
    Psychology, 75*, 175–184.
Russell CJ, Dean MA. (1994, April). *The effect of history on meta-analytic results: An
    example from personnel selection research*. Presented at the 9th Annual Conference
    of the Society of Industrial and Organizational Psychology, Orlando, FL.

Russell CJ, Mattson J, Devlin SE, Atwater D. (1988). Predictive validity of biodata items generated from retrospective life experience essays. *Journal of Applied Psychology, 75,* 569–580.

Salgado JF. (1997). The five factor model of personality and job performance in the European community. *Journal of Applied Psychology, 82,* 30–43.

Schmidt FL, Hunter JE, Pearlman K. (1981). Task differences and validity of aptitude tests in selection: A red herring. *Journal of Applied Psychology, 66,* 165–185.

Schmitt N, Gooding RZ, Noe RA, Kirsch M. (1984). Meta-analysis of validity studies published between 1964 and 1982 and the investigation of study characteristics. PERSONNEL PSYCHOLOGY, *37,* 407–422.

Stokes GS, Cooper LA. (1994). Selection using biodata: Old notions revisited. In Stokes GS, Mumford MD, Owens WA (Eds.), *Biodata handbook* (pp. 311–340). Palo Alto, CA: Consulting Psychologists Press, Inc.

Tett RP, Jackson DN, Rothstein M. (1991). Personality measures as predictors of job performance: A meta-analytic review. PERSONNEL PSYCHOLOGY, *44,* 703–742.

Wonderlic Personnel Test Manual (1983). Libertyville, IL: Wonderlic & Associates, Inc.

APPENDIX

Parallel Biodata Items for the Four Biodata Factors

I. Quantity and quality of work

What makes you most unhappy?

a. to have a friend refuse to speak to you
b. making a mistake at work
c. being embarrassed and laughed at by a crowd
d. being late for a meeting with your boss
e. none of these

How often do you do a task over and over again until it's perfect?

a. always
b. often
c. sometimes
d. almost never
e. never

About how many hours per day do you spend in constructive work?

a. less than 8
b. 8 to 10
c. 11 to 13
d. 14 to 16
e. more than 16

II. Problem solving

About how many nonfiction books have you read during the past year?

a. none
b. one
c. two
d. three

    e. four or more

How often have you invented something to serve a needed purpose?
    a. never
    b. 1 or 2 times
    c. 3 to 5 times
    d. 6 to 10 times
    e. more than 10 times

How do you typically make a difficult decision?
    a. make it as soon as you know all the facts
    b. sleep on it and decide when you're fresh
    c. think it over for a few days
    d. ponder it carefully for several days to consider every aspect

III. Interpersonal

When your opinions differ from others, what do you do?
    a. keep them to yourself
    b. express them openly
    c. express them only to friends
    d. always express agreement with others, even when you disagree

About how many new friends have you made during the past year?
    a. no need to make new friends
    b. one or two
    c. three to five
    d. six to then
    e. more than ten

How do you like to lead other people?
    a. by driving them
    b. by showing them
    c. by joking them into going along
    d. by setting an example
    e. some other way

IV. Perseverance

How often do you feel like quitting your job?
    a. never
    b. sometimes
    c. often
    d. very often
    e. all the time

What do you do with a cold, headache, or minor illness?
    a. stay home
    b. go to work but take it easy
    c. push yourself to work harder than ever

   d. ignore it completely

How hard is it for you to change your opinion once it is set?
   a. not hard at all, change opinions constantly
   b. not very hard, change opinions often
   c. somewhat hard, change opinions sometimes
   d. fairly hard, change opinions rarely
   e. extremely hard, almost never change opinions