Goals of the Research Department

1. The isolation of aptitudes and the study of their role in various occupations.
2. The development of accurate measures of aptitudes.
3. The investigation of the role of aptitudes in education.
5. The study of the processes involved in the acquisition of knowledge.
6. The development of accurate measures of knowledge.
7. The communication of research findings to the public.

Dr. Rex Jung presenting to the JOCRF-HEL-JOCRSC trustees in Albuquerque in October 2013 about his project using our tests to relate aptitude performance to brain function.
Letter from the Research Chairman

In October 2013, the Trustees of the Foundation and members of the Research Department met in Albuquerque, New Mexico, affording us all a wonderful opportunity to meet with Dr. Rex Jung and his talented young colleagues, and to get a close look at the equipment and methods involved in their neuroimaging research, some of which has been funded by the Johnson O'Connor Research Support Corporation (as discussed in previous Annual Reports).

Dr. Jung began with a brief overview of his research interests and most recent projects, and then introduced his associates, who explained their methods and procedures. Ranee Flores and Emmaly Owens discussed recruitment of subjects, and data collection and management. At the time of our meeting, 238 subjects had taken the Johnson O'Connor tests, and 164 had undergone neuroimaging. Jessica Carrasco explained the use of Tract-Based Spatial Statistics in analysis of Diffusion Tensor Imaging (DTI), a method for tracking the movement of water molecules in the brain’s "white matter," which allows researchers to estimate the integrity of the brain’s connective network. Chris Wertz described his work in analyzing subcortical structures and gray matter thickness in the subjects. Sephira Ryman related her work in bringing together data from the other researchers in order to identify brain networks. Andrei Vakhtin presented on the use of functional MRI and magnetoencephalography (MEG) to compare the activity of the brain while working on a specific task with the activity of the brain at rest. Our trustees and staff were very impressed with the poise and professionalism of these young researchers, and we look forward to the papers that will be resulting from their efforts.

The meeting then moved to the MIND Research Network facility on the north side of the university campus. After an introduction and overview of the MRN’s work by Dr. Jeffrey Lewine, we visited the MEG laboratory, where New York Director Steve Greene volunteered to serve as a subject while the rest of us were shown the procedures used by the technicians in the control room. The MEG looks something like a lounge chair with a very large salon hooded hair dryer. The subject’s head fits within the hood so that its 306 sensors can record the minute variations in electromagnetic activity in the neurons, millisecond by millisecond. The enormous volume of data that emerges is, of course, analyzed using some of the methods Dr. Jung’s associates explained to us earlier.

We also visited the MRI lab, where Foundation President David Ransom served as the subject, allowing us to have a look inside his battered skull (see the 2012 report for an account of his 2010 bicycle accident). According to Dr. Jung, all appeared to be well within the Ransom cranium, so we may look forward to his leadership for some time to come.

We all heartily thank Dr. Jung and his colleagues for the welcome we were accorded in Albuquerque, and for the fascinating look at the new tools that promise amazing advances in our understanding of the human brain, and of our natural abilities.

As delighted and inspired as we may be by the promise of these new methods of learning about the brain, our old tools -- our battery of aptitude tests -- remain our primary focus, and of course are indispensable components of the research programs. We are continually working to improve the tests, and to better understand what it is they are measuring. Much of the work of the Research Department in 2013, described in this Report, consisted of what we might think of as "housekeeping," working to ensure that our test battery remains the "gold standard" for the measurement of individual aptitudes. Whether looking at the long-term stability of the Pitch Discrimination and Rhythm Memory tests, developing new norms and studying the age curves of the auditory tests, analyzing new experimental Inductive Reasoning items and the errors made on the standard items, or evaluating a new method of administering the Wiggly Block test, we are committed to the continual effort to make our tests the best they can possibly be.

Validation, naturally, is not slighted: it's one thing to know that you've got a very reliable measuring device, another thing altogether to know what it is the device measures. The history of the Foundation is replete with tests which were developed to measure one thing and ended up measuring something apparently very different. The past year saw an analysis of former examinees now over the age of 65, looking at whether those scoring high in a given aptitude (such as Structural Visualization) had spent the better part of their careers in fields thought to use it. Results are beginning to emerge from Chicago staff member Scott Barsotti’s project investigating the aptitudes of theater artists. In addition to working up new norms and age curves for the auditory tests, Dr. Linda Houser-Marko investigated their relationships with college majors and occupations. Dr. David Schroeder contributed to the discussion in the testing community of sex differences in variability, or spread of scores, in ability tests. And a number of other staff members were engaged in validation projects which we hope will bear fruit in 2014.

The staff members of the Foundation remain enthusiastically engaged in keeping "Research" the vital core of our mission.
**Long-Term Stability**

For a number of years, we have been studying the long-term stability of our tests. In 2013, David Schroeder, Research Manager, carried out a study on Pitch Discrimination and Rhythm Memory and reported his findings in Statistical Bulletin 2013-12, *Long-Term Stability for Pitch Discrimination and Rhythm Memory*.

For Pitch Discrimination, we arranged for 426 examinees to re-take the test at an interval of 1 to 22 years from their original testing (the “long-term sample”). In addition, 65 examinees re-took Pitch Discrimination less than one year after their original testing (the “short-term sample”). For both samples, examinees showed a small practice effect, with scores on the retest about one-and-a-half to two points higher (on an 80-item test) than on the original testing. In terms of rank-ordering, examinees’ scores on the retest correlated .75 with scores on the original testing for the long-term sample and .88 for the short-term sample. Thus, Pitch Discrimination shows relatively high stability over long periods of time, and a portion of the change in scores appears to be due to short-term fluctuations (reflected in the short-term correlation) rather than long-term change.

When we divided the long-term sample for the Pitch test into those who were 14 to 19 years old at their original testing and those who were 20 and up, the correlation was higher for the older examinees (.81) than for the younger examinees (.66). Thus, the stability appears to be higher for examinees who were tested after their teen years.

For Rhythm Memory, the long-term sample consisted of 436 examinees tested 1 to 24 years after their original testing, and the short-term sample consisted of 122 examinees tested less than one year after their original testing. Both samples showed essentially no practice effect between their two testings. In terms of correlations, scores on the retest correlated .69 with scores on the original testing for the long-term sample and .68 for the short-term sample. Although the short-term correlation is a little lower than we would like to see (and may have been influenced by sampling error), it is gratifying that for the long-term sample, the longer time period between testings does not appear to have caused any material decline in the stability of scores.

When one divides the long-term sample by age at original testing, the correlation is .67 for ages 14-19 and .71 for 20 and up, and so there is not much of a difference there.

The short-term and long-term correlations for the Pitch and Rhythm tests are shown in the first accompanying figure. In the second figure, the distributions of differences in percentile scores for the two testings are shown for the long-term samples. As shown in the figure, most of the examinees show relatively small percentile differences between testings, with Rhythm Memory showing somewhat larger differences than Pitch Discrimination, apparently due to the greater short-term variation on the Rhythm test.

In general, these findings support our contention that aptitudes are stable over long periods of time.
Inductive Reasoning

For the last several years, we have studied items on the Foundation’s standard Inductive Reasoning test along with new experimental items. In late 2012, several test administrators—Steve Greene, Tim Fitzgerald, Cindy Rosner, Holly Wilhelm, among others—working with David Ransom, President of the Foundation, created a set of 20 experimental items, and the labs began to administer them in conjunction with the standard test. In 2013 David Schroeder analyzed data for the new experimental items, and the first accompanying figure shows the proportions of correct responses (p-values) for the items. As can be seen, the majority of the items have p-values of .80 or higher, but several are below .50, which is unusual for items on our test. The second accompanying figure shows the correlations of the items with the total score on the standard test. Ten of the items showed item-total correlations of .20 or higher, which is our usual standard for effective Inductive items. David Schroeder reported these results in Statistical Bulletin 2013-4, Analysis of Inductive Reasoning Experimental Items, Wks. 164 X* (2012-13).

Following on these findings, David Ransom prepared a revised set of experimental items in which 11 of the 20 items were retained without changes, 5 items were revised, and 4 new items were added. The labs began to administer this item set in July, and we expect to analyze the results for these items in early 2014.

Also in 2013, Schroeder analyzed the items in the standard Inductive test. Ten items had been inserted into the standard test in late 2012 in place of items that had shown weak item-total correlations or were problematical in other ways. The analysis indicated that several of the new items were performing well, and several were not performing as well as we would like. Five of the items were modified in mid-2013. Schroeder reported these findings in Statistical Bulletin 2013-3, Item Analysis of Inductive Reasoning Wks. 164 NA/NB.

As noted earlier, we have observed that items with lower p-values tend to show poorer agreement with the total score on the standard test. In 2013 Schroeder performed an analysis to see if such items are measuring a separate aptitude, such as power reasoning, as distinct from the overall score for the standard test, which is perhaps related to speed of reasoning. In short, the analysis showed that, in addition to low item-total correlations, the items with low p-values tend to show low correlations with each other and do not appear to measure a common variable. Schroeder published these results in Statistical Bulletin 2013-6, Items With High Error Rates on Inductive Reasoning.

Finally, in 2013 Schroeder summed the number of incorrect responses for examinees on the standard Inductive test and then performed analyses on these scores. The majority of our examinees do not make a large number of errors on our Inductive test, with a median value of nine errors, out of 58 scored items. Error scores show an alpha reliability of .671, which is probably because many of the items have very low error rates. Error scores correlate only -.15 with the total score for Inductive, which is consistent with the total score being mostly a function of speed rather than accuracy of response. The two-way distribution of error scores and total scores is shown in the accompanying figure.

Regarding the other tests in our battery, error scores show moderate negative correlations with our other reasoning tests (-.30 with Analytical Reasoning and -.24 with Number Series) and similar correlations with Wiggly Block, Paper Folding, Memory for Design, and English Vocabulary. Schroeder reported these findings in Statistical Bulletin 2013-5, Error Scores on Inductive Reasoning.
Two-Way Distribution of Error Scores & Total Scores for Inductive Reasoning

Images for IR

We are experimenting with alternative art to supplement the original drawn images. Including background distraction or shading when using photo or line art styles and mixing modern objects with traditional images permits us to add regular updating while maintaining linkage to the original test format and appearance. We have even tried color but not with the regular test yet.

Heritability

At the Foundation, we have had an abiding interest in genetic contributions to individual differences in aptitudes. In the 1990s, we conducted a twin study of our tests that David Ransom discussed in our annual report a year ago. In 2013 David Schroeder initiated an expanded study of the correlations between scores for twins on our tests. The accompanying figure shows the correlations for pairs of identical (monozygotic) and fraternal (dizygotic) twins for five Foundation tests. As can be seen, the correlations for the monozygotic twins tend to be higher than the correlations for the dizygotic twins, which indicates substantial genetic effects on these aptitudes. In 2014 Schroeder expects to present findings from this study at the annual meeting of the Behavior Genetics Association.

Wiggly Block

In 2013 the Foundation changed the administration of the Wiggly Block test. Since 2004, we had used the fixed-piece administration, in which the examinee builds each block piece-by-piece from a fixed starting piece. In 2012 the Atlanta, Boston, and Dallas labs began giving a new administration of the test in which the examinee does not begin from a fixed starting piece, but the test administrator also does not demonstrate the block divided into stacks and layers, as we did prior to 2004, which may have encouraged examinees to create subassemblies. In 2013 David Schroeder analyzed data from 1,259 examinees at the three labs who took Wiggly Block with the new administration. The results indicated that the test reliability for the new administration is essentially equal to the reliability for the fixed-piece administration. Inasmuch as the new administration eliminates the need for additional equipment (i.e., the board to which the starting piece is attached) and reduces restrictions on the examinees (having to start with the fixed piece), the Foundation chose to make the new procedure the standard administration to be used for the test.
Over 65 Study

Our recent study of alumni who are over age 65 under the direction of Dr. Linda Houser-Marko, Researcher has proven to be a fruitful effort. Tapping into the experiences of our oldest examinees seemed to offer an exciting opportunity to consider examinee satisfaction and what the influence of Johnson O'Connor aptitude testing has been over a lifetime. Since the Johnson O'Connor Research Foundation has been testing examinees for over ninety years, the time was right to focus on the oldest generation of our alumni to learn about their careers.

First, we recruited former examinees who were 65 and older through a Bulletin mailing. We asked them to complete a questionnaire about their education and past occupations. We were able to categorize the given occupations into the standard occupational categories that we use. If the occupation was unclear from the job title, we were able to gain more information from the short job descriptions that respondents provided.

We were able to pull information and aptitude scores from their testing for 83 of the survey respondents. For about 60 of them, the aptitude scores were collected from paper files kept by the testing offices (sometimes off-site), and for 20 of them, the aptitude records were available from our database. We are very grateful to the testing offices for their assistance with pulling these files. We had test scores for respondents who were tested from 1937 to 1995.

Then we considered which aptitude scores to examine. We looked for tests that were used over the time period and had not changed greatly. For the aptitude scores that we did have, we coded the respondents as either high or not high, splitting at the 70th percentile.

We consulted the JOCRF occupational plots to determine whether a high score for each aptitude was expected for each occupation of this study. We created a list of occupations for which we expected high scores in that aptitude and compiled that information with the respondent’s occupations.

With these two variables (score level expected for each occupation and aptitude score for the person), we were able to look for “matches” of occupation and aptitude scores for each respondent.

As can be seen below, the occupations and aptitudes were a good match for Structural Visualization scores. In other words, the respondents who scored high on this aptitude were frequently in occupations where we expected high scores. Data from other tests are still being analyzed.

Auditory Aptitudes Project

The auditory aptitude tests—Tonal Memory, Pitch Discrimination, and Rhythm Memory—are longstanding components of the Johnson O'Connor Research Foundation test battery. They were first administered in the 1940s as part of the larger group of Seashore music tests that included time, loudness, and timbre discrimination. These were pared down to the current three tests in the late 1970s. They have been adapted to new technology but remain essentially the same. The unchanging significance of these tests is evidence to the timelessness of the auditory aptitudes themselves. This year Linda Houser-Marko did a study of a few different aspects of the auditory aptitude tests.

The three auditory aptitudes together

In order to look at the auditory aptitudes as a set, we examined scores that were 70th percentile or higher in our dataset of 64,670 examinees. Groupings of examinees were made according to their auditory scores: high in all three, high in two, high in one, or high in none. The composition of the general population of examinees is shown in the figure on the next page.

About 12% of our testing population scored high in all three of the auditory aptitudes. About 21% of the examinee population scored high in two auditory aptitudes, about 29% scored high in one, and about 38% of the population scored high in none of the auditory aptitudes.

Auditory aptitudes and music

The three auditory tests take a singular approach to different aspects of auditory talents such as memory and intonation, and can be thought of as a set of music aptitudes. We confirmed this auditory aptitude and music connection by looking at aptitudes, college majors, and occupations. Examinees who majored in music in college had higher than average percentiles for the auditory tests: Tonal Memory mean was at the 89th percentile,
Pitch Discrimination mean was at the 84\textsuperscript{th} percentile, and Rhythm Memory mean was at the 80\textsuperscript{th} percentile.

**Musicians specifically**

There were 144 examinees in the dataset who indicated that their occupation was “musician” (occupational code 152, without any limitation of job years). On average, their percentiles for the auditory tests were similar to the music majors. Of the 144 musicians, 54\% had been music majors.

**Auditory aptitudes and other aptitudes**

The association between music and math has had a long history of theoretical support partly because of the similar basic principles and relationships within both areas. Music training has been shown to be associated with an increase in spatial and math skills in young children in an experimental intervention (Rauscher & Hinton, 2011). However some research has found that the relationship is not absolute—one study found that mathematicians were not more likely to be musical (Haimson, Swain, & Winner, 2011), though that study did not involve auditory ability tests. We wanted to know more about the relationship between auditory abilities and numerical abilities. We found that the auditory aptitude scores were correlated with scores for the tests of Number Series, Paper Folding, Wiggly Block, Memory for Design, and English Vocabulary.

The auditory aptitudes have also been thought to be associated with the pronunciation and intonation aspects of foreign languages. In an earlier questionnaire study conducted by the Foundation, foreign language learning and auditory abilities were associated. People who stated that foreign languages were “easy to learn” had higher auditory scores (SB 2011-19) compared to others who did not feel that way about foreign languages. We explored this further by looking at college majors, and found that examinees who had majored in a foreign language had higher than average auditory aptitudes, as can be seen below.

**College majors and occupations**

Next, the levels of the auditory scores were examined for individuals grouped by their college major that was stated on the information sheet. There were about 38,000 examinees in this dataset who were either in college or had been in college, and for whom we had college major information.

Quite a few college majors stood out as groups in which the mean level of one of the auditory scores was higher than average (i.e., $z > .20$, which is about the 58\textsuperscript{th} percentile). Foreign languages, humanities, mathematics, medicine, philosophy, physical science, and theater were all college majors in which people had notably high auditory scores. For occupations, the auditory aptitudes were generally higher for examinees in careers such as architects, medical doctors, professors, theater artists, and writers, as well as musicians.

**Frequency of high percentiles on the auditory tests in combination**

![Diagram showing the frequency of high percentiles on the auditory tests in combination.]

**Theater Artists Study**

This study of theater artists arose from the interest that Scott Barsotti (from the Chicago testing office) had after thinking about the collaborative nature of theater work. Specifically, we began to wonder if theater artists would be more likely to be Objective on the Word Association test. As it developed, this study was designed to look at professional theater artists’ work roles, work motivation, values, and work approach/personality. Slightly more than two hundred theater professionals completed an online survey. The figure on the next page shows the variety of roles in which the participants have worked. The majority of participants had a degree in theater arts or were members of professional associations or companies.

**Personality and work approach:** People with more Objective scores were more likely to endorse the notion that they were in theater “to be a part of a larger community,” and people with more Subjective scores were more likely to say they were in theater “to be a unique and creative specialist.” People with more Subjective scores were more likely to identify with the statements regarding autonomy and career satisfaction.

The group identifying primarily as actors had the lowest mean score (8) on the word association test, tending toward a more
“Subjective” work approach. Playwrights had the highest mean score (12), a more “Objective” work approach. Directors had the second highest mean score (11) on Word Association.

Work motivation and values: We also inquired about their motivation to work in theater. The theater artists generally indicated that they sought the respect of their peers, long-term collaborations, and to work in theaters that they admired. Comparing between roles, Playwrights gave higher ratings for questions with the fame and notoriety theme, and Directors gave higher ratings for questions with the collaboration and connection theme. Other motivations endorsed by the theater professionals included the notion of theater offering a sense of autonomy and identity, and also the notion of theater work being a place for the development of ideas and collaboration with others.

This survey was an important first step in the theater artist study because it provides some insight into how theater artists approach their field, which will be especially useful once we have more aptitude test scores to analyze. Examining test scores and survey responses will help us to clarify how those with different roles in theater have different strengths.

Additional Projects

Updating of test norms

We are continually evaluating the fit of norms and the need to update norms for tests in the Foundation battery. New norms were constructed for the test of Tweezer Dexterity this year. Also, at the same time as the auditory test project, norms for the tests of Tonal Memory, Pitch Discrimination, and Rhythm Memory were updated. The norms for the Foresight, Structural Visualization, Wiggly Block, Paper Folding, Memory for Design, Silograms, Observation, Finger Dexterity, and Grip tests have been updated in the past five years. Only a few tests remain for this cycle of norm updating.

Age curve for Tweezer Dexterity test

The figure below shows the new norms for the Tweezer Dexterity test. The additional age groups of the new norms allow the age curve to fit the natural curve of the data. This age curve for Tweezer Dexterity shows a gradual increase until about age 26, a plateau until about age 42, and a gradual decline through the end of the age range.

Age curves for Tonal Memory, Pitch Discrimination, and Rhythm Memory tests

The age curves for the auditory tests are shown in the figures below. Compared to other tests, these are largely flat, as the auditory aptitudes may develop before age 14, or the age of our youngest examinees, and not change very much over the lifetime.
Sex Differences in Variability

In 2012 David Schroeder conducted several studies of sex differences in variability (that is, in the spread of scores). In general, although many of our tests show sizable mean sex differences, the differences in variability are relatively modest. In 2013 Schroeder wrote up these studies in Technical Report 2013-1, Sex Differences in Variability.

Relationship Between ACT and Foundation Tests

Dr. Rex Jung’s study of creative achievement in science (see 2012 report, p. 3) gives us an opportunity to look at correlations between the four JOCRF measures he is using (English Vocabulary, Paper Folding, Inductive Reasoning, and Foresight) and a variety of other measures in his battery. In Statistical Bulletin 2013-13, Rusty Burke reported on the correlations between the JOC measures and scores on the ACT, one of the two most widely used college admissions tests. He found that, for the 131 subjects in the sample, English Vocabulary correlated very strongly with the overall (Composite) ACT scores and all four subtest scores (English, Math, Reading, and Science). Controlling for the common effect of Vocabulary, Paper Folding also correlated significantly with the ACT Composite score, especially the Math and Science sections, while Inductive Reasoning and Foresight did not correlate with any of the ACT scores. Burke plans to continue looking at the relationships between the JOC tests and other measures.

Client Satisfaction Study

Also in 2013, Amanda Summers, from the Chicago testing office, and Lisa Cook, from the Denver testing office, reported the results of a survey of satisfaction on the part of clients of the Foundation's testing service at their two offices. Clients who tested between November 2010 and March 2013 were asked to complete the survey, and 320 Chicago clients and 179 Denver clients responded to the request, for a response rate of about 30% for each office.

One question on the survey asked the clients to identify their reasons for coming in for testing, and the results for this question are shown in the figure on p. 10. Clients reported a number of different reasons for being tested: The most common reason was to choose a major or focus for an educational degree, and the second-most-common reason was to acquire self-knowledge. As one might expect, younger clients were more likely to be tested in order to choose a major, whereas older clients were more likely to report being at a “career crossroads” or being “curious about new career options.”

Other questions on the survey asked about client satisfaction with particular aspects of our service. It was gratifying to see that very high proportions of clients were very satisfied with most aspects of our service. For example, 75.4% of clients reported being “completely satisfied” with their summary sessions, and 17.6% said they were “mostly satisfied.” The satisfaction ratings for the audiovisual testing were also high, but not as high as for the one-on-one testing or the summaries.

Finally, clients were asked if they would recommend our services to others, and the results are shown in the figure below. For the two offices combined, 79.6% of clients said that they “Absolutely” would recommend us.

Summers and Cook wrote up their findings in Statistical Bulletin 2013-11, Results of Online Examinee Satisfaction Survey in Chicago and Denver. The Chicago and Denver offices are now administering the survey to their clients on an ongoing basis, and several other offices are using it with their clients as well.
Observations & Announcements

Gallia est omnis divisa in partes tres. As with Gaul, all JOCRF research is divided into three parts: the first is the department quartered in Chicago, where David Schroeder and Linda Houser-Marko manage the affairs and data analysis and Rusty Burke travels to visit frequently; the second involves these same individuals but is based on our support corporation funding of outside researchers, including Rex Jung and Richard Haier, to carry out projects with technology and analytic tools beyond our capacity; the third incorporates the imagination and contribution of various staff members working to devise new and better tests and to isolate new and distinct aptitudes. This third effort is under the spotlight here. It has been supported in part by a generous grant given by a private foundation to help the process of discovery. It stems from a gift of securities to the Johnson O'Connor Research Foundation shortly after the death of our founder, with the thought that his vision should be carried forward with help from a committed admirer. We strive to honor this gift with our research.

The aptitude tests tried out so far now number in the 700s, but we only give some two dozen currently. The seashore is strewn with the flotsam and jetsam and driftwood of many others, from Dr. Seashore's Timbre or Time Discrimination to Lunar Logic or Proportion Appraisal on down to some recent attempts, like Turning Block and Sequential Memory.

We persist in our endeavor to create new tests: we will soon resume administering the experimental Image Inspection, a visual scanning of objects to compare with Graphoria, our venerable test measuring the ability to scan columns of numbers. As discussed in this report, we are progressing on the long-term project of expanding our item collection for Inductive Reasoning. Kurt Conover and his Atlanta testing staff, Steve Greene and fellow New Yorkers, and Cindy Rosner with Boston support — along with others — have been pitching in with new items to try. For the brain research, a good number of reconceived and designed Paper Folding and Inductive Reasoning items were constructed. We have our minds set on Analytical Reasoning next.

In the last decade of the last century several eager staff members experimented with touch screen test administration. They were ahead of the technology of the time. We have also tried out computerized vocabulary testing. Several outside businesses have purchased and reworked some of the original JOCRF tests, even demonstrating an Analytical Reasoning look-alike and others online while obtaining some of our research reports for their validation. We are contemplating where to migrate over the next decade or so. Simplified timing and scoring, computer adaptive testing, and online testing are all subjects of consideration and debate.

David Ransom
President
JOCRF
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JOCRSC

Our testing program as of now continues to work well for us. We have a highly selected testing staff with good clerical speed and large and (mostly) exact English vocabularies. Examinees apparently appreciate what we do, as satisfaction studies over the years have verified. The personal touch from intelligent, articulate, caring test administrators has been our strength. For our future, we want to remain true to Johnson O’Connor’s vision while adapting to changing times. The Internet and its possibilities challenge us: to gather information and insight into the application of aptitudes, to find new technology to measure individual differences in natural abilities, and to facilitate a broader dissemination of our findings.

Although we have made adjustments regularly, we remain mostly in the analog world of hands-on test equipment with personal test administration. As we advance, we need first to move from time-motion stopwatches and hand-written score sheets to direct scoring into computer databases. In our testing environment, our examinees still have the touch and feel of chips to move on a board. Our analog techniques have their charms. Whether we plunge into full-blown computerized testing or continue on our present path is Hamlet’s to be or not to be. This might someday become moot given Richard Haier’s prognostication that brain scanning will end up short circuiting individual testing with direct assessment of mental potential.

Demonstration MRI scan at the MIND Institute for JOCRF trustees

As stated above, there are the three parts of our research effort: the first to polish and perfect, the second to chase the uncertain dream, and the third to splash around, looking for inspiration and insight. This is a call to our testing staff to join in with new ideas for tests and procedures. One example might be the daughter of Steve Greene looking into test validation or development from a crew of app writers at Stuyvesant High School in New York. Let us seek some others!
Dissemination of Research Findings

In recent years we have made it a practice to present some of our findings in scholarly outlets such as professional conferences and journals. In 2013 Dr. Rex Jung and his associates, the team of scholars whose work on neuroimaging research we are supporting through the Johnson O'Connor Research Support Corporation, prepared a journal article on some of their findings. The article is titled “Subcortical Correlates of Individual Differences in Aptitude,” and it was published in the online journal *PLoS ONE* in early 2014. The article has already been viewed by 360 persons.

Our previous scholarly work continued to receive attention in 2013. Our 2010 article with Dr. Richard Haier and his associates in *BMC Research Notes* has now been viewed 10,154 times, while our 2012 article by Dr. David Schroeder and others in *BMC* has been viewed 908 times. According to Google Scholar, the 2010 Haier et al. article has been cited in 10 scholarly journal articles and books, and our 2009 article with Haier and others in *Intelligence* has been cited 38 times. In addition, our 2010 article with Dr. Cheuk Tang and others in *Intelligence* has been cited in 27 articles and books.

With regard to earlier publications, Schroeder’s 2004 article with Drs. Timothy Salthouse and Emilio Ferrer in *Developmental Psychology* has now been cited in 68 scholarly journal articles and books, and his article with Salthouse in *Personality and Individual Differences* has been cited 37 times. Our 2001 *Intelligence* article by Dr. Scott Acton, former research assistant in the Research Department, and Schroeder has been cited 37 times.

In 2014 Dr. Linda Houser-Marko expects to present a paper on her study of auditory aptitudes at the annual meeting of the Association for Psychological Science, and Schroeder expects to make a presentation on the scores of twins on the Foundation’s tests at the meeting of the Behavior Genetics Association.

Research Department Staff

**Russell E. Burke**, Research Chairman, has also served as Director in Washington, D.C. He is our senior summarizer and writer interpreting research information to the staff. An autodidact by inclination following a degree in Religious Studies at University of Tennessee, he joined the Foundation in 1983 in New Orleans and served as Director in Houston before moving to the nation’s capital, living on Capitol Hill.

**David H. Schroeder**, Research Manager, joined the Research Department in August 1984. He has a B.S. from the University of Illinois and an M.S. from Colorado State University, as well as an M.A. and a Ph.D. in personality psychology from The Johns Hopkins University.

**Linda S. Houser-Marko**, Researcher, joined the Research Department in October 2010. She has a B.A. from Gustavus Adolphus College in Minnesota and a Ph.D. in social and personality psychology from University of Missouri. She has published research on the self, identity, and motivation.

### Reasons for clients to test at JOCRf

- **Choosing college major/focus**
- **Curiosity/desire for self-knowledge**
- **Curious about new career options**
- **Positive experience of friend/relative**
- **Career crossroads** (promotion, new direction, etc.)
- **Decide on a school** (technical, liberal arts, etc.)
- **Unhappy with current occupation**
- **Retirement planning**
- **Other (various specified reasons)**
- **Returning to career after absence**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Chicago n=320</th>
<th>Denver n=179</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choosing college major/focus</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td>Curiosity/desire for self-knowledge</td>
<td>20%</td>
<td>15%</td>
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<tr>
<td>Curious about new career options</td>
<td>20%</td>
<td>15%</td>
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<tr>
<td>Positive experience of friend/relative</td>
<td>15%</td>
<td>10%</td>
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<tr>
<td>Career crossroads (promotion, new direction, etc.)</td>
<td>10%</td>
<td>5%</td>
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<tr>
<td>Decide on a school (technical, liberal arts, etc.)</td>
<td>5%</td>
<td>0%</td>
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<tr>
<td>Unhappy with current occupation</td>
<td>0%</td>
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<tr>
<td>Retirement planning</td>
<td>0%</td>
<td>0%</td>
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<tr>
<td>Other (various specified reasons)</td>
<td>0%</td>
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<tr>
<td>Returning to career after absence</td>
<td>0%</td>
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### Recent Statistical Bulletins

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<th>Year</th>
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<td>2013-2</td>
<td>The Auditory Aptitudes: More Than Just Music</td>
<td>Linda Houser-Marko</td>
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<td>2013-3</td>
<td>Item Analysis of Inductive Reasoning Wks. 164 NA/NB</td>
<td>David Schroeder</td>
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<td>2013-4</td>
<td>Analysis of Inductive Reasoning Experimental Items, Wks. 164 X*</td>
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<td>Error Scores on Inductive Reasoning</td>
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<td>2013-6</td>
<td>Items With High Error Rates on Inductive Reasoning</td>
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<td>2013-7</td>
<td>Internal Analysis of Non-Fixed-Piece Administration of Wiggly Block (Form EN)</td>
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<td>Age Curves for the Auditory Tests</td>
<td>Linda Houser-Marko, David Schroeder</td>
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<td>2013-9</td>
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<td>Equating Scores on Memory for Design Wks. 294 VD With Scores on Wks. 294 UQ</td>
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<td>Results of Online Examinee Satisfaction Survey</td>
<td>Amanda Summers (Chicago)</td>
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<td>Lisa Cook (Denver)</td>
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<td>2013-12</td>
<td>Long-Term Stability for Pitch Discrimination and Rhythm Memory</td>
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<td>2013-13</td>
<td>Correlations of Four JOCRF Measures With ACT Scores</td>
<td>Rusty Burke</td>
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### Recent Technical Reports

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<tr>
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<td>Sex Differences in Variability</td>
<td>D. Schroeder</td>
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<td>2012-1</td>
<td>Aptitudes, Vocabulary, and Educational Attainment</td>
<td>D. Schroeder</td>
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<td>2012-2</td>
<td>The Aptitudes of Engineering Students</td>
<td>C. Condon, D. Schroeder</td>
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<td>2012-3</td>
<td>Four Studies of the Self-Directed Search</td>
<td>D. Schroeder</td>
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<td>2008-1</td>
<td>Is the Flynn Effect Primarily a Rise in Structural Visualization?</td>
<td>C. Condon, D. Schroeder</td>
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<td>2008-2</td>
<td>Memory for Design: Internal Characteristics and Validation Data</td>
<td>D. Schroeder, C. Condon</td>
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<td>2007-1</td>
<td>Analyses of Fixed-Piece and Standard Administrations and Alternative Scoring Methods on the Wiggly Block Test</td>
<td>D. Schroeder, C. Condon</td>
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<td>2005-1</td>
<td>The Aptitudes of Attorneys</td>
<td>S. Goldman, D. Schroeder, K. M. Jang</td>
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<td>2003-1</td>
<td>The Aptitudes of Software Engineers</td>
<td>R. Burke, T. Fitzgerald</td>
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Recent Publications


Recent Presentations


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Kurt E. Conover
Richard C. Gershon
Robert F. Kyle
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Rex Jung slide in presentation to JOCR board in Albuquerque, October 2013