Knowledge, Skills, Aptitudes and Qualities of Exceptional Intelligence Analysts

A Resource for Training and Selection Tool Development

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Abstract

In this report we surveyed the academic literature, hiring notices, and subject matter experts to establish a list of qualities, skills and aptitudes for exceptional intelligence analysts. We also list several key kinds of knowledge that must be possessed by analysts in order to be effective. In a second phase in the review, we identify which qualities, aptitudes and skills can be measured using psychometric instruments. Finally, for each skill and quality of the effective analyst, we consider whether it can be improved by training, or whether it is a skill that must be used as a basis for selection.

Significance to Defence and Security

This document is intended to provide personnel selection officers with a resource to enhance the processes by which intelligence analyst positions are staffed.

Résumé

Pour ce rapport, nous avons consulté la littérature didactique, ainsi que des avis d'embauche et avons interrogé des experts en la matière dans le but d'établir une liste des qualités, des compétences et des aptitudes que doit posséder un analyste du renseignement exceptionnel. Nous avons aussi dressé la liste de plusieurs types de connaissances clés qu'un analyste doit avoir afin d'être efficace. Nous avons ensuite déterminé les qualités, les aptitudes et les compétences qui peuvent être mesurées au moyen d'instruments psychométriques. Enfin, nous nous sommes demandé si la formation permettait d'améliorer chacune des compétences et des qualités d'un analyste efficace ou si chacune d'entre elles devait être utilisée à des fins de sélection.

Importance pour la défense et la sécurité

Ce document vise à fournir aux agents de sélection du personnel un outil leur permettant d'améliorer les procédures de recrutement des analystes du renseignement.

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1 Introduction

In 2012 and 2013, a team of DRDC scientists and contractors interviewed All-Source Intelligence Centre (ASIC) commanders to identify what they considered the factors that enhanced the effectiveness of individual analysts, and those working in teams. Our Subject Matter Experts (SMEs) pointed out to us that the road to readiness for those working in the ASIC is a long one, and is not well-suited to the short time frame provided to construct the ASIC team. In particular, they pointed out that some critical skills take time to develop, such as:

1. Doing analysis itself. Even the best analyst needs time to build the necessary knowledge of the subject matter and practice to get up to speed. However, to do so effectively, knowledge generated from one rotation to the next needs to be captured in a way that newly arriving personnel can get up to speed quickly on what background information needs to be considered when making new assessments.

2. Learning and working together to build intelligence good products.

Quite apart from the skills that are built during training and pre-deployment, analysts are faced with factors that constantly threaten their effectiveness. Our SMEs identified fatigue as an obvious, but key factor affecting performance. But perhaps even more insidious is the fear and stress that comes from knowing that there is 'always something more that can be read or analysed' that can negatively affect analysts' focus.

Some factors affecting performance can be, and are, addressed at the institutional level. It is not the purpose of this report to comment on the CAFs procedures and practices for staffing or educating intelligence centres. Other factors affecting performance lie squarely within the human domain. This report will focus on the "human aspects" of effective analyst performance in an ASIC. Specifically, in what follows we have attempted to identify the critical Knowledge, Skills, Aptitudes and Qualities (KSAQs) of effective analysts working in an intelligence centre.

What kinds of people are ideally suited to work in the ASIC? What personality characteristics do highly effective analysts have? What kind of knowledge does a highly effective analyst have? In other words, what kinds of information should be studied and learned before deployment? What skills and abilities or aptitudes does (s)he have? The distinction between Skills and Aptitudes can be murky so we shall reserve the term s*kills* for competent performance that is reached as a result of training and *aptitudes* as the contribution that innate or genetic factors play in a person's level of performance or competence.

To identify the KSAQs of analysts, we extracted information from two sources.

1. Interviews with seven former ASICs commanders who deployed to Afghanistan. Much of the content from these interviews is captured in Adams et al. (2013) contract report done as part of a scoping activity under the project that is now JICAC. During the interview, we asked commanders to comment on what they noticed to be the important characteristics of effective analysts generally, and also to describe the characteristics of the most skilled analysts under their command. The observations of the commanders relevant to KSAQs are included in this report in greater detail.

2. A review of documents describing KSAQs created by the wider Intelligence Community (IC) including and police, public safety organisations in both Canada and the United States. These documents included opinion pieces, handbooks, and hiring notices.

Information from the two sources was used to create a taxonomy of KSAQs for intelligence analysts. When possible and appropriate, for each KSAQ, we searched the academic literature for:

1. A validated psychometric inventory designed to measure or assess the skill, aptitude or quality; and

2. Information regarding the extent to which a critical skill or ability of successful analysts can be improved by training or must be used as a basis for selection.

2 Knowledge and Technical Ability

In this section, we outline the general knowledge and technical ability expected from analysts based on SME interviews and hiring notices for analysts within the wider IC.

2.1 Effective Analyst Knowledge

The Effective Analyst has Knowledge of:

1. Tradecraft:
    a. Analysis processes (data access, collection, collation, analysis, dissemination and feedback).
    b. Analysis techniques from specialized training and education programs for intelligence.
    c. Specialized computer software systems available to support intelligence analysis. Can include information sources (e.g., databases), tools, and services available to analysts.
2. The information requirements and objectives of users of intelligence.
3. The function played by the analyst's intelligence organisation.
4. The function played by other intelligence organisations.
5. The organisational (chain of command), legislative, policy, and doctrinal constraints on analysts' activities.

2.2 Effective Analyst Technical Ability

The Effective Analyst has the Technical Ability to:

1. Use a computer, which might include the ability to:
    a. Use basic software tools. (e.g., Microsoft Office suite comprising Word, Excel, Access, PowerPoint, Outlook).
    b. Learn to use new computer software.
    c. Learn basic computer programming and IT skills.
    d. Conduct research, especially using the internet as a resource.
    e. Identify and troubleshoot problems and bugs with computer programs.
    f. Accurately and appropriately file information.

2. Create and interpret visual presentation of data or information, sometimes complex graphical information, in the form of charts, graphs, maps, and tables.

3. Learn and use basic statistics.

3 Mental Ability

3.1 General Mental Ability

According to our SMEs and Moore and Krizan's (2003) review of National Security Agency (NSA) analysts' skills, the effective analyst must be able to:

1. Think critically.

2. Multi-task, or switch tasks effectively.

3. Prioritize tasks.

4. Coordinate tasks.

5. Think objectively with respect to the analysis, interpretation and classification of information.

The General Mental Ability to think critically (#1 above) and objectively (#5 above) are part of what could generally be referred to as "Intellect". Intellect comprises a set of enabling cognitive functions that underpin analysis. In the Section 3.2 and 3.3, we separate Intellect into component skills that are, or might be, critical for effective analysis.

Reference(s):

Moore D. T, & Krizan, L. (2003). Core Competencies for Intelligence Analysis at the National Security Agency. In R.G. Swenson (Ed.) *Bringing Intelligence About: Practioners Reflect on Best Practices*. Centre for Strategic Intelligence Research.

3.2 Specific Cognitive Skills/Processes that are Relevant to Effective Analysis

In Section 3.1, we touched upon a set of general mental abilities identified by SMEs. Intellect is multidimensional, however, and as such must be separated into various aspects. In this section, we separate *Intellect* into a set of more specific cognitive abilities that, we felt, correspond with skills identified by SMEs during our interviews. These are shown in Table 1. Then, for each specific cognitive ability, we searched for articles that indicated whether or not it could be improved or developed through training. The idea was that, if a cognitive function can be improved through training, then it may not be necessary to select analysts who perform at a level that exceeds a minimum criterion—journeymen can be brought up to minimally acceptable level of skill. Alternatively, if a cognitive function is impervious to training, an applicant's level of ability with respect to the function must be used as a basis for selection.

Table 1: *Cognitive skills and abilities underpinning effective intelligence analysis.*

Psychological Ability	**Description**	**Improved by training**	**Example Reference(s)**
Mental Agility	Ability to switch between tasks effectively. In cognitive psychology we would refer to this as "executive control".	Yes	Karbach, J. & Kray, J. (2009). How useful is executive control training? Age differences in near and far transfer of task-switching training, Developmental Science, 12, 1–13.
Working Memory (WM) Capacity	WM is where one carries out mental operations. WM Capacity is the amount of information that one can retain and work on at one time.	Yes	Jaeggi, S. M., Buschkuehl, M., Jonides, H. & Perrig, W.J. (2008). Improving fluid intelligence with training on working memory. Proceedings of the National Academy of Sciences, 105, 6829–6822.
Metacognition	Conscious and deliberate thoughts that have as their object other thoughts. They fit into two areas: 1. Knowledge of one's knowledge, process, and cognitive and affective states; and 2. The ability to consciously and deliberately monitor and regulate one's knowledge, process and cognitive and affective states.	Yes	Kuhn, D. and Dean, D. J. (2004). "Metacognition: a bridge between cognitive psychology and educational practice." Theory into Practice (Autumn). Hacker, D. J. (n.d.). "Metacognition: Definitions and empirical foundations." Retrieved 23 April, 2004, from http://www.psyc.memphis.edu/trg/meta.htm.
Attention to Detail	One's ability to identify and use all the information required to complete a task, without missing important parts.	Perhaps	No academic references. Lots of online courses targeting business audience. No validation.
Attention (pop-out)	The ability to rapidly locate and identify target objects in a visual field.	Yes	Heathcote, A., & Mewhort, D. J. K. (1993). Representation and selection of relative position. *Journal of Experimental Psychology: Human Perception and Performance, 19*, 488–515.
Attention (divided)	The ability to multitask.	Yes	Dux, P. E. et al. (2009). Training improves multitasking performance by increasing the speed of information processing in human prefrontal cortex. *Neuron*, 63, 127–138.
Attention (vigilance)	The ability to concentrate on a single task.	Yes	Attwood, D. A. & Weiner, E. L. (1969). Automated instruction for vigilance training, 53, 219–223. Szalma, J. L., Hancock, P. A., Dember, W. N. & Warm, J. S. (2006). Training for vigilance: The effect of result format and dispositional optimism and pessimism on performance and stress. British Journal of Psychology, 97, 115–135. Szalma, J. L., Hancock, P. A., Warm, J. S., Dember, W. N. & Parsons, K. S. (2006). Human Factors, 48(4), 682–692.

Psychological Ability	Description	Improved by training	Example Reference(s)
Reading Comprehension	The ability to understand what one is reading.	Yes	Willingham, D. T. (2007). The usefulness of brief instruction in reading comprehension strategies. American Educator, 50, 39–45.
Implicit Learning	One's sensitivity to unconsciously learning the rules that govern the sequence or co-occurrence of events. This can manifest itself as a "spider sense" that something is wrong, or that something is going to occur.	Unknown	Although there are individual differences that can be measured, there does not seem to be any work done to see if it can be improved.
Reasoning Ability	The ability to solve problems presented verbally or visually.	Yes, but training may not transfer to new tasks	Bauer, M. I. & Johnson-Laird, P. N. (1993). How diagrams can improve reasoning, Psychological Science, 6, 372–378. Owen et el. (2010). Putting the brain to the test. Nature, 465, 775–778.
Bias in Decision Making	The tendency for irrelevant information to affect the decision making process. For example, does a "SECRET" designation increase the likelihood that an analyst will consider the document important?	Yes	Milkman, K. L., Chugh, D., Bazerman, M. H. (2009). How can decision making be improved? Perspectives on Psychological Science, 4(4), 379–383.
Pattern Recognition	Ability to perceive patterns, meaningful clusters, or sequences.	Unknown	There are several businesses selling brain work-out programs that are meant to improve pattern recognition ability. But we were unable to find any work validating the programs in a scholarly literature search For this reason, they should be approached with some skepticism.
Comprehension of Information Presented Visually	The speed and accuracy with which people can pick up information presented in visual media like graphs or visual displays.	Maybe	We can measure individual difference in ability: Shah, P. & Hoeffner, J. (2002). Review of graph comprehension research: Implications for instruction. Educational Psychology Review, 14, 47–69.

4 Qualities of Exceptional Analysts

Apart from their work habits and intellectual ability, employers and SMEs noted a long list of personality or dispositional qualities possessed by exceptional analysts. These are listed below. For each, we searched online for validated inventories that purport to measure them. In many cases, the instruments described below are available online.

4.1 Resiliency

Being able to keep working and stay focussed, even if there are valid threats to it. For example, if one's work was associated with the death of an adversary it can weigh heavily and impede one's ability to function at work.

Reference(s):

Connor, K. M. & Davidson, J. R. T. (2003). Development of a new resilience scale: The Connor–Davidson Resilience Scale (CD-RISC). Depression and Anxiety, 18, 77–82.

4.2 Adaptability

The intelligence centre is a dynamic work environment requiring its members to be able to change tasks and re-prioritize activities in response to changing demands or requirement. We found one document, a Master's thesis from George Mason University (Grim, 2010) describing an inventory to measure Adaptability. Interestingly, validation included its administration to a sample of military members.

Reference(s):

Grim, A. M. (2010). Use of situational judgment test to measure individual adaptability in applied settings. Unpublished Master's Thesis, George Mason University.

4.3 Integrity and Honesty

An internet search on this topic revealed very little recent research being done on the measurement of integrity and honesty. We did however find a Wikipedia page (https://en.wikipedia.org/wiki/Employment_integrity_testing) on the topic as it relates to employees that provided some information as to the nature of the tests currently in use by employers and what they measure. There are four commercial tests that purport to overtly measure integrity and honesty. The information about each test is taken from a table provided by Barrett (2001):

1. The London House Personnel Selection (PSI). This test purports to measure honesty, drug avoidance, non-violence, stress tolerance, safety, work values, attitudes toward supervision, responsibility, productivity, and attitude toward customers.

2. The Reid Report. A widely used test developed in the 1950s, it contains questions regarding attitudes towards honesty, admissions of criminal behaviour, substance use, and workplace incidents.

3. The Stanton Survey. Developed in the 1960s, it focuses on honesty and ignores issues around workplace violence and drug use that they claim "dilute the effectiveness of the survey." (http://www.plotkingroup.com/Employment_Prescreening/Stanton_Survey.php).

4. Phase II Profile. This tool purports to measure one's ability to rationalize dishonesty, how often a dishonest act is thought about or planned, attitudes toward honesty, and admissions of dishonesty.

Aside from the obvious moral and legal implications of not hiring someone because you suspect he/she might do something dishonest, there is little clear evidence that such tests predict job performance. For example, Ones, Viswesvaran, Chockalingam and Schmidt (1993) reported a significant relationship between measures of integrity and job performance ratings provided by supervisors. On the other hand, Guastello and Rieke (1991) argued that such tests have little ability to predict dishonest behaviour such as, workplace theft. The difference between the studies might have to do with the criterion measure to judge behaviour. Most employees, probably, do not steal from the workplace, and when they do, they are not always caught. Hence, their correlation is likely low because it is based on very low variability on their behavioural measure. On the contrary, ratings of job performance can be highly variable, and as such are more likely to provide more meaningful correlation. In sum, although our SMEs identified honesty and integrity as important qualities of the exceptional analyst, it is not clear that they can be measured in a meaningful way.

Reference(s):

Barrett, P. (2001). Pre-employment Integrity testing: Current methods, problems, and solutions. *Proceedings of the British Computer Society: Information Security Specialist Group*. March, 2001.

Guastello, S. J. & Rieke, M. L. (1991). A review and critique of honesty test research. Behavioral Sciences & the Law, 9, 501–523.

Ones, D. S., Viswesvaran, C., Schmidt, F. L. (1993). Comprehensive meta-analysis of integrity test validities: Findings and implications for personnel selection and theories of job performance. *Journal of Applied Psychology, 78*, 679–703.

4.4 Effective Communication

Not surprisingly, the bulk of research on effective communication is conducted within the medical profession where the quality of communication between medic and patient is critical. The online search turned up one inventory that assessed communication skills, but it was focused on the medical profession and would not be easily made more generic. It is therefore not included here.

4.5 Public Speaking

The ability to speak in public was identified as an important quality of the analyst. Presumably, the ability is useful when one must speak up as part of a group of analysts, and when briefing the commander on the contents of a report. One noted reason for one's discomfort during public performances like speaking comes from having social anxiety (Fresco, Coles, Heimberg, Liebowitz, Hami, Stein & Goetz, 2001). Hence, to an extent, assessing someone's level of social anxiety. There is one widely used instrument, the Liebowitz Social Anxiety Scale (Liebowitz, 1987) that measures social anxiety. The instrument is a 24-item scale, 13 of which asses anxiety and avoidance behaviours in performance situations like, reporting to a group or eating in public. Our search also uncovered an instrument specifically designed to assess one's fear of public speaking. Heeren, Ceschim Valentiner, Dethier and Philippot (2013) developed and validated a 12-item scale to assess fear of public speaking. The scale also correlated highly with tests measuring Social Anxiety, Fear of Negative Evaluation, and Trait Anxiety.

Reference(s):

Fresco, D. M., Coles, M. E., Heimberg, R. G., Liebowitz, M. R., Hami, S., Stein, M. B. & Goetz, D. (2001). The Liebowitz Social Anxiety Scale: a comparison of the psychometric properties of self-report and clinician-administered formats. *Psychological Medicine,* 31, 1025–1035.

Heeren, A., Ceschim, G., Valentiner, D. P., Dethier, V., & Philippot, P. (2013). Assessing public speaking fear with the short form of the Personal Report of Confidence as a Speaker scale: confirmatory factor analyses among a French-speaking community sample. Neuropsychiatric, *Disease and Treatment*, 9,609–618.

Liebowitz M. R. (1987). Social phobia. *Modern Problems of Pharmacopsychiatry*, 22, 141–173.

4.6 Sociability

SMEs identified the ability to get along well with others as critical within an intelligence centre. How one's social skills are assessed can happen in several ways: through behavioural checklists, observation and coding of behaviour, and questionnaires that could be completed by and about one's self, or completed to asses another person (Perry & Felce, date unknown). Perry and Felce provide a thorough review of assessment tools, and could be consulted for advice on which instrument would be most appropriate for use by commanders.

Reference(s):

Perry, J., & Felce, D. (2004). Assessing work-related social skills: Existing approaches and instruments. Walsh Centre for Learning Disabilities Cardiff University.

4.7 The Courage to Speak Truth to Power

Put simply, this quality refers to one's willingness to make statements a commander may not wish to hear or ask questions that the commander may not wish to answer. It is difficult to identify a

quality for such an ability. However, it can perhaps be separated into two qualities that, together predict it. We surmise that the courage to speak truth to power requires assertiveness, but with a respect for those in authority.

4.7.1 Assertiveness

We found few recent resources to measure assertiveness. We found one promising inventory, the Assertiveness Inventory (Alberti & Emmons, 1995) but it is published in a self-published self-help book. Therefore we cannot comment on its reliability and validity.

Reference(s):

Alberti, R. E. & Emmons, M. (1995). Your perfect right: A guide to assertive living, Impact Publishing: Atascadero, CA.

4.7.2 Respect for Authority

We found several references to the study of attitudes towards authority, several of which include inventories to measure respondent's attitudes to various aspects of authority. Our finding is that the selection of tests is somewhat dated with most papers being published in the 1970s and 1980s. Yet, regardless of their age, the inventories may be adequate, or at least form a basis for the development of a scale for use by the CAF intelligence group.

Reference(s):

Ray, J. J. (1971). An "Attitude to Authority" scale. Australian Psychologist, 6, 31–50.

Rigby K., & Rump, E. E. (1979). The generality of attitude to authority. Human Relations, 32, 469–487.

Ray, J. J. & Lovejoy, F. H. (1990). Does attitude to authority exist? Personality & Individual Differences, Vo. 11, No. 8, 765–769, 1990.

4.8 Positive Attitude

According to SMEs, analysts that have a positive attitude are more effective than those who do not. One SME broke the quality into three component sub-qualities: Hope (the belief that when things are bad, they will get better), Humour (the ability make light of frustrating situations and joke with peers) and a Can-Do Attitude.

Table 2: *References for articles relevant to having a positive attitude.*

Hope	Snyder, C. R., Harris, C., Anderson, J. R., Holleran, S. A., Irving, L. M., Sigmon, S. T., et al.(1991). The will and the ways: Development and validation of an individual-differences measure of hope. *Journal of Personality and Social Psychology, 60*, 570–585. Humour.
Humour	Martin, R. A., Puhlik-Doris, P., Larsen, G., Gray, J., & Weir, K. (2003). Individual differences in uses of humor and their relation to psychological well-being: Development of the Humor Styles Questionnaire. *Journal of Research in Personality, 37*(1), 148–75.
Can-Do Attitude	Matt, M. (1996). Attitude: The Choice is Yours. American Media Inc.: New York.

An online search revealed no validated instruments for measuring one's general attitude. We did find one inventory posted on the University of Idaho's website that, at least on the surface, seems to tap into the extent to which one has a Can-Do Attitude. The inventory itself has no references, but claims to be adapted from a self-help book by Matt (1996) called, *Attitude: The Choice is Yours*. The inventory should perhaps be taken with a grain of salt because the publisher of the book from which it is adapted is the company that publishes such journals as *The National Enquirer, Men's Fitness, and Soap Opera Digest*.

4.9 Curiosity

Every source from which we gathered information about qualities of effective analysts identified a strong sense of curiosity as being important. Curiosity is generally seen as what drives the analyst to want (or intrinsic need) to figure out the facts or a puzzle associated with an analysis, and also what keeps the analyst's attention engaged for long periods while he or she conducts an analysis. We found one reference to an inventory measuring this quality.

Reference(s):

Kashdan, T., Gallagher, M. W., Winterstein, B. P., Breen, W. E., Steger, M. F. (2009). The Curiosity and Exploration Inventory-II: Development, Factor Structure, and Psychometrics. *Journal of Research in Personality, 43,* 987–998.

4.10 Self-motivation

There appears to be one widely used inventory to measure self-motivation which was originally developed to predict adherence to exercise therapies.

Reference(s):

Dishman, R. K., & Ickes, W. (1981). Self-motivation and adherence to therapeutic exercise. *Journal of Behavioral Medicine, 4,* 421–438.

5 Conclusion

In this report, we identified critical KSAQs for intelligence analysts as articulated by CAF SMEs and described by practitioners and employers in other intelligence organisations. Our intent for the report was to provide a starting for staffing positions within an intelligence centre. For many of the skills, aptitudes and qualities identified in the document, there are validated psychometric tests for measurement, or empirical evidence from laboratories that they can be measured and, in some cases, improved through training.

We have outlined what leaders within the intelligence community identify as important KSAQs of exceptional analysts. As extensive as the list might be, we have not worked with commanders or practitioners to prioritize them. Future work might also examine the KSAQs more critically to devise a set that could reasonably be used as an initial step in identifying analysts who are likely to excel in their tasks.

A promising future step forward may be the transformation of some experimental paradigms into training or selection applications or instruments for specific mental abilities. For many qualities or abilities, respondents' scores are based on scored questionnaires (e.g., social anxiety questionnaire) or completed tests (e.g., an IQ test). Aspects of selection and training could be improved even further by adapting experimental paradigms into performance-based measures of specific cognitive abilities. For example, consider Working Memory Capacity— the amount of information that one can mentally hold and work on at one time. Jaeggi, Buschkuehl, Jonides, and Perrig (2008) reported experiments demonstrating that working memory capacity could be expanded with training. There is no reason in principle why the experimental paradigm Jaeggi et al used could not, on the one hand, be used to assess working capacity and on the other, be used as a tool to improve it among journeyman analysts.

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References

Adams, B. D., Bruyn, L. R., DeWit, M. H. & Thomson, D. (2013). Human dimensions of future intelligence analysis capability: Support materials for research proposal. *HumanSystems Contract Report. Contract No: W7711-088136/001/TOR*.

Alberti, R. E. & Emmons, M. (1995). Your perfect right: A guide to assertive living, Impact Publishing: Atascadero, CA.

Attwood, D. A. & Weiner, E. L. (1969). Automated instruction for vigilance training, 53, 219–223.

Barrett, P. (2001). Pre-employment Integrity testing: Current methods, problems, and solutions. *Proceedings of the British Computer Society: Information Security Specialist Group*. March, 2001.

Bauer, M. I. & Johnson-Laird, P. N. (1993). How diagrams can improve reasoning, Psychological Science, 6, 372–378.

Connor, K. M. & Davidson, J. R. T. (2003). Development of a new resilience scale: The Connor–Davidson Resilience Scale (CD-RISC). Depression and Anxiety, 18, 77–82.

Dishman, R. K., & Ickes, W. (1981). Self-motivation and adherence to therapeutic exercise. *Journal of Behavioral Medicine, 4,* 421–438.

Dux, P.E. et al. (2009). Training improves multitasking performance by increasing the speed of information processing in human prefrontal cortex. *Neuron*, 63, 127–138.

Fresco, D. M., Coles, M. E., Heimberg, R. G., Liebowitz, M. R., Hami, S., Stein, M. B. & Goetz, D. (2001). The Liebowitz Social Anxiety Scale: a comparison of the psychometric properties of self-report and clinician-administered formats. *Psychological Medicine,* 31, 1025–1035.

Guastello, S. J. & Rieke, M. L. (1991). A review and critique of honesty test research. Behavioral Sciences & the Law, 9, 501–523.

Grim, A. M. (2010). Use of situational judgment test to measure individual adaptability in applied settings. Unpublished Master's Thesis, George Mason University.

Heathcote, A., & Mewhort, D. J. K. (1993). Representation and selection of relative position. *Journal of Experimental Psychology: Human Perception and Performance, 19*, 488–515.

Hacker, D. J. (n.d.). "Metacognition: Definitions and empirical foundations." Retrieved 23 April, 2004, from http://www.psyc.memphis.edu/trg/meta.htm.

Heeren, A., Ceschim, G., Valentiner, D. P., Dethier, V., & Philippot, P. (2013). Assessing public speaking fear with the short form of the Personal Report of Confidence as a Speaker scale: confirmatory factor analyses among a French-speaking community sample. Neuropsychiatric, *Disease and Treatment*, 9 609–618.

Jaeggi, S. M., Buschkuehl, M., Jonides, H. & Perrig, W. J. (2008). Improving fluid intelligence with training on working memory. Proceedings of the National Academy of Sciences, 105, 6829–6822.

Kashdan T. Gallagher, M. W., Winterstein, B. P., Breen, W. E., Steger, M. F. (2009) The Curiosity and Exploration Inventory-II: Development, Factor Structure, and Psychometrics. *Journal of Research in Personality, 43,* 987–998.

Karbach J. & Kray J. (2009). How useful is executive control training? Age differences in near and far transfer of task-switching training, Developmental Science, 12, 1–13.

Liebowitz M. R. (1987). Social phobia. *Modern Problems of Pharmacopsychiatry*, 22, 141–173.

Kuhn, D. and Dean, D. J. (2004). "Metacognition: a bridge between cognitive psychology and educational practice." **Theory into Practice** (Autumn).

Martin, R. A., Puhlik-Doris, P., Larsen, G., Gray, J., & Weir, K. (2003). Individual differences in uses of humor and their relation to psychological well-being: Development of the Humor Styles Questionnaire. *Journal of Research in Personality, 37*(1), 148–75.

Matt, M. (1996). Attitude: The Choice is Yours. American Media Inc.: New York.

Milkman, K.L., Chugh, D., Bazerman, M.H. (2009). How can decision making be improved? Perspectives on Psychological Science, 4(4), 379–383.

Moore D. T, & Krizan, L. (2003). Core Competencies for Intelligence Analysis at the National Security Agency. In R.G. Swenson (Ed.) *Bringing Intelligence About: Practioners Reflect on Best Practices*. Centre for Strategic Intelligence Research.

Owen et al. (2010). Putting the brain to the test. Nature, 465, 775–778.

Ones, D. S., Viswesvaran, C., Schmidt, F. L. (1993). Comprehensive meta-analysis of integrity test validities: Findings and implications for personnel selection and theories of job performance. Journal of Applied Psychology, 78, 679–703.

Perry, J., & Felce, D. (2004). Assessing work-related social skills: Existing approaches and instruments. Walsh Centre for Learning Disabilities Cardiff University.

Ray, J. J. (1971). An "attitude to authority" scale. Australian Psychologist, 6, 31–50.

Ray, J. J. & Lovejoy, F. H. (1990). Does attitude to authority exist? Personality & Individual Differences, Vo. 11, No. 8, 765–769, 1990.

Rigby K., & Rump, E. E. (1979). The generality of attitude to authority. Human Relations, 32, 469–487.

Shah, P. & Hoeffner, J. (2002). Review of graph comprehension research: Implications for instruction. Educational Psychology Review, 14, 47–69.

Snyder, C. R., Harris, C., Anderson, J. R., Holleran, S. A., Irving, L. M., Sigmon, S. T., et al. (1991). The will and the ways: Development and validation of an individual-differences measure of hope. *Journal of Personality and Social Psychology, 60*, 570–585. Humour.

Szalma, J. L., Hancock, P. A., Dember, W. N. & Warm, J. S. (2006). Training for vigilance: The effect of result format and dispositional optimism and pessimism on performance and stress. British Journal of Psychology, 97, 115–135.

Szalma, J. L., Hancock, P. A., Warm, J. S., Dember, W. N. & Parsons, K. S. (2006). Human Factors, 48(4), 682–692.

Willingham, D. T. (2007). The usefulness of brief instruction in reading comprehension strategies. American Educator, 50, 39–45.

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List of Symbols/Abbreviations/Acronyms/Initialisms

ASIC	All-Source Intelligence Centre
CAF	Canadian Armed Forces
DND	Department of National Defence
DRDC	Defence Research and Development Canada
DSTKIM	Director Science and Technology Knowledge and Information Management
IC	Intelligence Community
JICAC	Joint Intelligence Collection and Analysis Capability
KSAQ	Knowledge, Skills, Aptitudes and Qualities
n.d.	no date
NSA	National Security Agency
PSel	Personnel Selection
SME	Subject Matter Expert
TDO	Training & Development Officer

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In this report we surveyed the academic literature, hiring notices, and subject matter experts to establish a list of qualities, skills and aptitudes for exceptional intelligence analysts. We also list several key kinds of knowledge that must be possessed by analysts in order to be effective. In a second phase in the review, we identify which qualities, aptitudes and skills can be measured using psychometric instruments. Finally, for each skill and quality of the effective analyst, we consider whether it can be improved by training, or whether it is a skill that must be used as a basis for selection.

Pour ce rapport, nous avons consulté la littérature didactique, ainsi que des avis d'embauche et avons interrogé des experts en la matière dans le but d'établir une liste des qualités, des compétences et des aptitudes que doit posséder un analyste du renseignement exceptionnel. Nous avons aussi dressé la liste de plusieurs types de connaissances clés qu'un analyste doit avoir afin d'être efficace. Nous avons ensuite déterminé les qualités, les aptitudes et les compétences qui peuvent être mesurées au moyen d'instruments psychométriques. Enfin, nous nous sommes demandé si la formation permettait d'améliorer chacune des compétences et des qualités d'un analyste efficace ou si chacune d'entre elles devait être utilisée à des fins de sélection.

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Selection; training; intelligence; analysis