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VARIABILITY IN SHIP HANDLING EXPERTISE AS EXPLAINED BY PERSONALITY AND COGNITIVE STYLE

by

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13. ABSTRACT *(maximum 200 words)*

VEs provide the capability for a trainee to practice and master complex and highly dangerous tasks safely, efficiently, and economically. By understanding what makes one expert different from another, expertise is more accurately modeled by the virtual experts performing training in the VE. While time at sea is the best trainer that can never be completely replaced, the hand and glove relationship a tailored VE training session provides will directly result in a higher level of proficiency without the necessity of additional resources. This study investigates what factors affect task expertise variability in UNREP evolutions by using results of a personality inventory and a cognitive style inventory to predict the degree an UNREP expert is analogical vice analytical. In this study, the analogical expert is more recogition based and utilizes more global types of information. The analytical expert exhibits analytical information usage and analytical information processing methods. Participants consisted of 5 Unites States Navy Commanders (O-5), all of which have been designated Surface Warfare their entire careers. Personality was measured with the NEO Five Factor Inventory (NEO-FFI) and cognitive style was measured with the Embedded Figures Test (EFT). Analogical Degree (AD) was measured by analyzing responses to an oral interview dealing with an UNREP scenario. Results indicate a strong positive correlation between Neuroticism and AD. Extraversion, Agreeableness, and

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ABSTRACT

VEs provide the capability for a trainee to practice and master complex and highly dangerous tasks safely, efficiently, and economically. By understanding what makes one expert different from another, expertise is more accurately modeled by the virtual experts performing training in the VE. While time at sea is the best trainer that can never be completely replaced, the hand and glove relationship a tailored VE training session provides will directly result in a higher level of proficiency without the necessity of additional resources. This study investigates what factors affect task expertise variability in UNREP evolutions by using results of a personality inventory and a cognitive style inventory to predict the degree an UNREP expert is analogical vice analytical. In this study, the analogical expert is more recogition based and utilizes more global types of information. The analytical expert exhibits analytical information usage and analytical information processing methods. Participants consisted of 5 Unites States Navy Commanders (O-5), all of which have been designated Surface Warfare their entire careers. Personality was measured with the NEO Five Factor Inventory (NEO-FFI) and cognitive style was measured with the Embedded Figures Test (EFT). Analogical Degree (AD) was measured by analyzing responses to an oral interview dealing with an UNREP scenario. Results indicate a strong positive correlation between Neuroticism and AD. Extraversion, Agreeableness, and EFT exhibit a strong negative correlation. Openness to Experience displays a moderate negative correlation while Conscientiousness appears to have no correlation with AD. Due to the small sample size of five participants, a logistical regression is not possible since there are six predictors resulting in no degrees of freedom.

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VARIABILITY IN SHIP HANDLING EXPERTISE AS EXPLAINED BY PERSONALITY AND COGNITIVE STYLE

OVERVIEW

Whether a marine, soldier, sailor, or airman, the United States Military warrior of the new millennium is required to do more with less. Fewer troops, weapons, training time, and fiscal resources are requiring the armed forces to re-evaluate every facet of operations. In particular, budget drawdowns combined with warfare evolving into unconventional special operation low intensity conflicts, and increasing complexity of hardware, it seems highly desirable and necessary to create a cost-effective training alternative. As computing power and speed increase, the desire for utilizing computers as beneficial training tools also increases. Using modern computers ever increasing high fidelity video to replicate virtual environments (VEs) as a training tool for spatial tasks is a particular area of increasing demand. VEs provide the capability for a trainee to practice and master complex and highly dangerous tasks safely, efficiently, and economically. However, before a task is taught, it must be mastered. Without task expertise, spatial video fidelity and sophisticated artificial intelligence (AI) are useless. In order for VE training projects such as Commanding Officer Virtual Environment (COVE) to be effective, task expertise of underway replenishment (UNREP) must be understood and accurately modeled before positive transfer is successful and millions of dollars and lives are lost.

The UNREP evolution is an ideal task for VE training. While the UNREP is one of the greatest showcases of skills for the surface warfare officer, it is also one of the

most dangerous where the potential for loss of life and damage to not only one but two ships is extremely high. The ability to actually practice this formidable task at sea is limited and can quickly evolve into a situation too complex for a junior officer to handle. These criteria result in good VE training being crucial since it allows the opportunity for officers to develop prerequisite skills in a safe and controlled environment with minimal operating cost.

This study investigates what factors affect task expertise variability in UNREP evolutions. By understanding what makes one expert different from another, expertise is more accurately modeled by the virtual experts performing training in the VE. Furthermore, understanding experts' strengths and weaknesses allows for the proper virtual expert and trainee pairing, enhancing positive transfer.

BACKGROUND

Naval officers achieve the prestige of command only by displaying sustained superior performance. As the senior ship driver aboard, and one person ultimately responsible for any mishap, the commanding officer (CO) is the resident ship-handling expert. How a ship is driven is a direct statement about the ship handling abilities of its CO. Few evolutions make or break a CO's reputation like the UNREP approach to the auxiliary replenishment ship since the approach is a calling card for the CO's style and ability. While all UNREP experts achieve the same ultimate end goal of coming along side the replenishment ship, different COs achieve this task differently. Some prefer to "John Wayne" with large speed differentials and small distances from "rubbing paint" while others prefer more of a slow and steady approach. Some COs base decisions on aggregate big picture data while others require more specific input. Since variability in

ship-handling expertise is as diverse as the ship-handling experts, this investigation examines variability in expertise by investigating the variability exhibited by experts.

Expertise itself is diverse. Chi, Glaser, and Farr (1988) segregate expertise into the four following categories:

1. Practical expertise that primarily deals with motor skills or mental skills. Examples of practical skills are typing, memorizing restaurant orders, or mental calculation. This type of expertise often allows for parallel thought processing.
2. Problem solving expertise requiring specific domain related knowledge. Examples of problem solving expertise are computer programming or solving physics problems.
3. Ill-defined expertise that requires decisions under uncertainty, such as when some uncontrolled intervening event occurs between the choice and the outcome. An example of an ill-defined problem is predicting stock market performance. Research has shown that "simple linear regression models have performed as accurately as experts have" (Chi, et. al., pg. 504).
4. Diagnostic expertise where metacognition is required to accurately access the reason for a given circumstance or set of facts. An example of diagnostic expertise is properly accessing an illness or medical condition from x-rays or symptoms.

UNREPs are dynamic, complex tasks that can not be neatly categorized as a single type of expertise. All four expertise categories apply. Commands are issued and executed with practical expertise. Estimating times and speeds in open ocean utilize

problem-solving techniques. Given the dynamic nature of an UNREP due to the uncontrollable forces of nature and the interactions of two separate independent ship drivers simultaneously, UNREPs require both ill-defined and diagnostic expertise.

In distinguishing themselves from novices, experts share common traits. These commonalties were summarized by Chi, et. al. as: (a) experts excel mainly at their own domains, (b) experts perceive large meaningful patterns in their domains, (c) experts quickly solve problems with little error, (d) experts have superior short-term and long-term memory, (e) experts see and represent a problem at a deep (more principled) level, (f) experts spend a great deal of time analyzing a problem qualitatively, and (g) experts have strong self monitoring skills. These traits usually result in an expert performing a task quicker and with fewer errors.

Despite commonalties, experts do have significant differences. Cohen, Freeman, Fallesen, Marvin, and Bresnick (1996) assessed how senior Army officers made critical battlefield decisions. Not all experts analyze situations and make decisions the same way. Most experts generally fall into two completely different paradigms. Some experts follow an analytical approach where decision making is characterized by attempting to use rational and computational methods. In contrast, a recognition expert would attempt to make decisions based on fitting the situation into a known pattern and responding with a familiar label or plan of action.

Michel and Riedel (1988) investigated the effects of expertise, cognitive style, and mission on what information is used by senior Army officers during tactical decision making in an attempt to develop a tactical decision aid. Their research indicated that a tactical decision aid must be adaptable to individual differences such as personality,

cognitive style, and preferences for sensory modality and communication mode. These findings correlate with Heslegrave and Colvin's (1996) research on how Army officers performed under stressful situations. Their findings showed that personality exhibited some consistent patterns of response to stressful situations. Their research assumed that there is a reciprocal causality between individual, situational, and response variables and that the way an individual responds to a situation is directly affected by the individual's personality.

Personality is often explained by the five-factor model, which describes personality in terms of five distinct personality traits. The Revised NEO Personality Inventory (NEO-PI-R), a widely accepted measure of personality developed by Paul Costa and Robert McCrae, assesses personality in terms of Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. Cloninger (1996) states that the five factors of personality have implications for occupational performance and therapy, and describes the five personality factors in the following way:

1. Extraversion is the factor that describes people who are rated by their peers as "sociable, fun-loving, affectionate, friendly, and talkative" (McCrae & Costa, 1987, p. 87)
2. People high in Agreeableness are forgiving, lenient, sympathetic, agreeable, and softhearted, according to peer ratings (1987). Peers describe those low in Agreeableness in more negative terms: ruthless, uncooperative, suspicious, and stingy.
3. Peers describe people high in Conscientiousness as careful, well organized, punctual, ambitious, and persevering (1987). Conscientiousness "includes

both proactive (hardworking, ambitious) and inhibitive (dutiful, scrupulous) aspects" (1989c, p 116).

4. People who score high on Neuroticism typically report negative emotions such as worry, insecurity, self-consciousness, and tempermentalness (1987)
5. The final factor in this model is Openness to Experience. Adjectives from lexical studies that describe this factor include "original, imaginative, broad interests, and daring" (1987, p. 87).

Cognitive style affects the way an expert organizes and retrieves data in his memory (Michel and Riedel, 1988). Therefore, cognitive style directly affects what information an expert utilizes and how that information is processed. The Embedded Figures Test (EFT) is a widely accepted measure of cognitive style since it measures the global-analytic dimension of cognitive functioning. The EFT is popular because of: (a) its acceptable validity and reliability (Witkin, Ortman, Raskin, and Karp, 1971), (b) its relatively short time to administer, and (c) it is content free since it is not susceptible to a social desirability bias. Independent tests have demonstrated that EFT scores correlate with information usage.

PURPOSE

This study uses results of a personality inventory and a cognitive style inventory to predict the degree an UNREP expert is analogical vice analytical. In this study, the analogical expert is more recogition based and utilizes more global types of information. The analytical expert exhibits analytical information usage and analytical information processing methods.

This investigation researches the hypothesis that the Analogical Degree (AD) of an expert is not independent of personality and cognitive style. The researcher expects that there is a relationship between the predictors, personality and cognitive style, and the response, AD. Since personality and cognitive style direct affect how we behave and think, it seems to follow that these factors affect how we perform intricate and dynamic tasks requiring expertise. This investigation will attempt to support this theory by looking at random UNREP experts with different combinations of personality and cognitive style and determine whether these predictors correlate with the response of AD.

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METHOD

PARTICIPANTS

Participants consisted of 5 Unites States Navy Commanders (O-5), all of which have been designated Surface Warfare their entire careers. Four of the five had served in Executive Officer positions as their last sea going billet, and one had served as a Commanding Officer. All participants are currently in a shore rotation and are male with an average age of 39.5 years and an average time of active service of 18.5 years. Other biographical and predictor information is summarized in Table 1. All experiments were conducted at the Naval Postgraduate School during a period of two weeks. The experiment lasted approximately 50 minutes.

APPARATUS

Major apparatus for this experiment consisted of two components. One component used was the NEO-Five-Factor Inventory (NEO-FFI). The NEO-FFI is a brief 60 question subset of the full 240 question NEO-PI-R. The NEO-PI-R's additional length allows for more precise measurement and better false answer detection. The NEO-FFI was chosen because of its relatively short length and ease of scoring and interpretation.

Costa and McCrae (1997) re-evaluated the usefulness and applicability of the NEO-PI-R. Their findings indicated "far more evidence of its comprehensiveness, universality, and practical relevance today than when the NEO-PI was first published" (Costa and McCrae, 1997, p. 87). Furthermore, Costa and McCrae do not envision any

significant changes in the structure of the NEO-PI-R in the near future. Therefore, since the NEO-FFI is a 60-question subset of the NEO-PI-R, it is a logical conclusion that there are no major revision planned for the NEO-FFI.

The other major apparatus used in the experiment was the EFT. The EFT kit consists of a stylus, two sets of complex test figures, one set of simple figures, and one set of practice figures. The two sets of test figures are identical in quantity and composition and are referred to as Set A and Set B. Set A was used for all participants and Set B was reserved in case a re-test was required. Each set consists of 12 complex figures. The simple figures set consisted of 8 simple figures that were embedded within the 12 complex figures or Set A and Set B. The figure combination of Set A is summarized in Table 2.

The UNREP interview required no major apparatus. The interview only required a tape recorder to record the participant's response for further analysis. Participants were supplied paper and pencil for any diagrams they used for explanation or to organize their thoughts.

PROCEDURE

The trials were conducted in accordance with the experimental protocol summary and experiment instructions in APPENDIX B. Participants were first given a short presentation on the goal of the investigation and informed that all results were confidential. Next, all participants completed a short background questionnaire. The background questionnaire is summarized in APPENDIX A.

After the background questionnaire was completed, all participants were administered the NEO-FFI, EFT, and UNREP interview based upon an assigned participant number and the experimental protocol summary. The experimental protocol summary was designed to counterbalance the effects of the individual tasks of the experiment amongst five participants. The five volunteer participants were randomly assigned a participant number in order to randomly counterbalance the experiment.

When administered the NEO-FFI, the participant was instructed to respond with the first answer that came to mind after reading the question and to attempt to not analyze the question. This is intended to prevent the participant from giving a response that is more contrived than instinctual. Participants were also warned that while the questions were presented in a column format, the answer sheet was constructed in a row format. Answers to the 60 question inventory had five responses ranging from Strongly Disagree (SD) to Strongly Agree (SA). There was no time limit for the participant to answer all 60 questions.

When administered the EFT, participants were read all instructions in accordance with the experimental instructions. The participants were given a practice trial consisting of a specific practice complex figure and simple figure. Participants were presented with the complex figure for 15 seconds. The complex figure was then covered by the simple figure for 10 seconds. After 10 seconds, the simple figure was removed, the timer was started, and the participant was instructed to locate a simple figure embedded in the complex figure. While, the participant was never allowed to see both the simple and complex figure simultaneously, he was allowed to see the simple figure for 10 seconds as many times as required. These 10 second refreshes did not count towards the 3 minute

maximum. The participant was required to locate the simple figure embedded within the complex figure with exactly the same dimensions and orientation as the simple figure. If the participant did not trace the proper figure with the stylus, he was informed of his error and asked to try again. Once the figure was properly located, the timer was stopped and the time recorded. If the embedded figure was not found at the end of 3 minutes, the timer was stopped and 180 seconds was recorded. This process was repeated for all 12 complex figures.

When administered the UNREP interview, participants were presented with a role-playing scenario. In the scenario, participants were asked to simulate a senior officer training a junior officer prior to an UNREP evolution. Participants were asked to concentrate primarily on the approach phase and to emphasize critical milestones and information required to make decisions. The interview was designed to be vague in order to determine the type of information required by the participant. All questions and responses by the participants were recorded both on paper and a tape recorder for further analysis. If not covered, participants were prompted for their primary information sources, preferred methods of communication, use of checklists and routines, and appraisal of current written guidance. The interview had no time limit.

After all the data was collected, raw scores for all five NEO-FFI categories and average times for the EFT were computed. Raw scores for the NEO-FFI were converted to a T score, which gives a scalar measure of relative strength of the five personality characteristics. T scores range from 25 on the very low end, to 75 on the very high end. All responses from the interview were categorized as either analytical or analogical and given a rating of 0 to 10 based upon the individual participant's emphasis of the

importance of the response. Analytical and analogical averages were computed by summing all responses in each category and dividing by the total possible points as described by equation 1 or equation 2.

Equation 1

$$\text{ANALYTICAL AVERAGE} = \frac{\text{SUM ANALYTICAL RESPONSE POINTS}}{\text{NUMBER ANALYTICAL RESPONSES} * 10}$$

Equation 2

$$\text{ANALOGICAL AVERAGE} = \frac{\text{SUM ANALOGICAL RESPONSE POINTS}}{\text{NUMBER ANALOGICAL RESPONSES} * 10}$$

The Analogical Degree (AD) was calculated by computing the percentage of responses that were analogical from an individual participant. Equation 3 delineates the AD calculation.

Equation 3

$$\text{ANALOGICAL DEGREE} = \frac{\text{ANALOGICAL AVERAGE}}{\text{ANALOGICAL AVERAGE} + \text{ANALYTICAL AVERAGE}}$$

This experiment utilized a multiple group design where each individual participant represented a group of independent variables and a single dependent variable with multiple levels. Independent variables consisted of each of the five NEO-FFI T scores and the EFT average response time for a total of six predictors. The dependent variable, or response, is AD, which is a scalar ranging from zero to one.

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RESULTS

Table 3 summarizes the five personality scores, EFT average, and AD for all five participants: 45 to 55 is the average range for all NEO-FFI scores. Table 4 summarizes descriptive statistics for participant's NEO-FFI and EFT scores. All five participants scored in the low category for Neuroticism with little variance. On average, the participants were high in Agreeableness and Extraversion and average in all other categories. The participants exhibited large variances in Openness and Agreeableness scores. Witkin, et. al (1971) listed a mean EFT time of 47.7 seconds with a standard deviation (SD) of 26.3 seconds for sampled 37-year-old males. Participants averaged 15 seconds lower than Witkin's average with a smaller SD.

UNREP interview results varied from participant to participant, regardless of AD. Participants with high AD usually replied with answers involving situational awareness and instinct. A reference to driving a car was used repeatedly to describe the type of sensory skills required for a successful evolution. Participants with lower AD scores usually replied with answers requiring rules of thumb or procedural compliance. Regardless of AD, no subject utilized the provided blank paper for any diagrams or calculations.

Table 3 data was exported from a Microsoft Excel spreadsheet into a text file for input into the ARC statistical package. Once in ARC, summary statistics are computed and a sample correlation matrix is output.

Table 5 summarizes the ARC correlation matrix based on Table 3 data: Neuroticism displayed the only strong positive correlation with AD ($\rho = .88$). Figure 1

graphically displays how AD scores correlated with the participant's Neuroticism T score. Extraversion (ρ = -.73), Agreeableness (ρ = –.71), and EFT (ρ = -.73) exhibit a strong negative correlation. Openness to Experience displays a moderate negative correlation (ρ = -.56) while Conscientiousness appears to have no correlation with AD (ρ = .07).

Due to the small sample size of five participants, a regression is not possible since there are six predictors resulting in no degrees of freedom. Further research will have a significantly larger sample size to allow for calculations of a logistical regression, modeling AD from the six independent variables.

DISCUSSION

HYPOTHESES

An observed strong correlation between the four predictors, Neuroticism, Extraversion, Agreeableness, and EFT, and the response, Analogical Degree indicates the following:

1. UNREP expertise is variable
2. Type of expertise is related to cognitive style
3. Type of expertise is related to some aspects of personality

Different levels of AD amongst participants demonstrated variability in expertise. Participants who displayed large AD typically were higher in Neuroticism, and lower in Extraversion, Agreeableness, and EFT. Low EFT scores indicate a global cognitive style which correlates with the low AD of a recognition based expert.

Findings supported previous research that there is a relationship between a participant's expertise and his distinct personality and cognitive style factors. Specifically, the level of Neuroticism, Extraversion and global cognitive style determine the extent an expert is analogical in his expertise.

Unfortunately the small sample size did not allow a statistical computation of a logistical regression model. This resulted in an inability to compute a statistical p-value, preventing firm mathematical evidence to reject the null hypothesis. While initial results indicate correlation between four predictors and AD, the lack of a logistical model prevents exploring which predictors are redundant and which predictors are most

significant. Furthermore, the small sample size has very small power resulting in this experiment having high probability of both type I and type II error.

Another possible problem with the data set could be the study's definition of an expert. All participants were designated experts solely on their highest sea-going billet held and time at sea. While, arguments are made that these are insufficient, it is clear that the United States Navy believes that these people are experts or else they would not have achieved their respected positions. Furthermore, it would be impractical and against privacy laws to research the backgrounds of s to determine reputations and past performance levels.

Finally, individual scores for analogical degree are participant to interpretation. Determining the degree of analogical or analytical for a participant's response is subjective to the interviewer's interpretation. At times, body language or inflection was used to determine the nature of a response.

The displayed relationship between individual factors and expertise allows for personnel running a VE trainer to tailor the simulation to the trainee. After a few short questions posed to a trainee, the training simulation will be able to enhance weaknesses or sharpen strengths with minimal training time. While time at sea is the best trainer that can never be completely replaced, the hand and glove relationship a tailored VE training session provides will directly result in a higher level of proficiency without the necessity of additional resources.

FURTHER STUDY

Initial results indicate further study is warranted. A larger sample size will increase power against type II error and decrease probability of committing type I error.

The larger sample will also accommodate a statistical model, detailing specific relationships between the predictors of personality and Cognitive style, and the response analogical degree. Possible travel could include Newport, Rhode Island to use either a Prospective Commanding Officer or Prospective Executive Officer class as participants. Further research should also investigate the use of an automated data collection system. Michel and Riedel (1988) created a computer program that recorded data requested by senior Army officers during a wargaming scenario. This type of data collection method would allow for simultaneous testing of many participants and produce more consistent results, reducing the subjectivity of the interviewer in determining the participant's analogical degree.

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Table 1. Summary of participant biographical and predictor information

	Mean	Std Dev	Min	Max
Total months at sea	98	8.25	90	112
Months since at sea	32.80	25.96	9	62
Total approximate number of UNREPs	145.00	95.85	75	250

Table 2: Order of Figures for Set A

Complex Figure	Simple Form	Complex Figure	Simple Form
1	A	7	F
2	B	8	E
3	C	9	C
4	D	10	G
5	E	11	A
6	A	12	H

Table 3: Predictor and response summary for all five participants

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5
Neuroticism	45	36	42	38	45
Extraversion	58	75	54	53	58
Openness To Experience	43	75	63	55	25
Agreeableness	39	74	48	65	74
Conscientiousness	63	57	46	45	60
EFT	12.08	65.00	39.33	28.67	18.75
Analogical Average	6.91	2.33	5.25	5.00	6.91
Analytical Average	2.31	8.00	1.46	6.15	3.54
Analogical Degree	0.74	0.22	0.78	0.44	0.66

Table 4: Summary statistics for participant traits

	Mean	Standard Deviation	Min	Max
Neuroticism T score	41.20	4.09	36	45
Extraversion T score	59.60	8.91	53	75
Openness T score	52.20	19.16	25	75
Agreeableness T score	60.00	15.83	39	74
Conscientiousness T score	54.20	8.23	45	63
EFT average time (seconds)	32.77	20.76	12.08	65.00

Table 5: Correlation matrix from ARC statistical package

	NEURO	EXTRA	OPEN	AGRE	CONS	EFT	AD
NEURO	1.00	-0.52	-0.82	-0.48	0.47	-0.83	0.88
EXTRA	-0.52	1.00	0.48	0.46	0.43	0.73	-0.73
OPEN	-0.82	0.48	1.00	0.01	-0.46	0.86	-0.56
AGRE	-0.48	0.46	0.01	1.00	-0.02	0.45	-0.71
CONS	0.47	0.43	-0.46	-0.02	1.00	-0.28	0.07
EFT	-0.83	0.73	0.86	0.45	-0.28	1.00	-0.73
AD	0.88	-0.73	-0.56	-0.71	0.07	-0.73	1.00

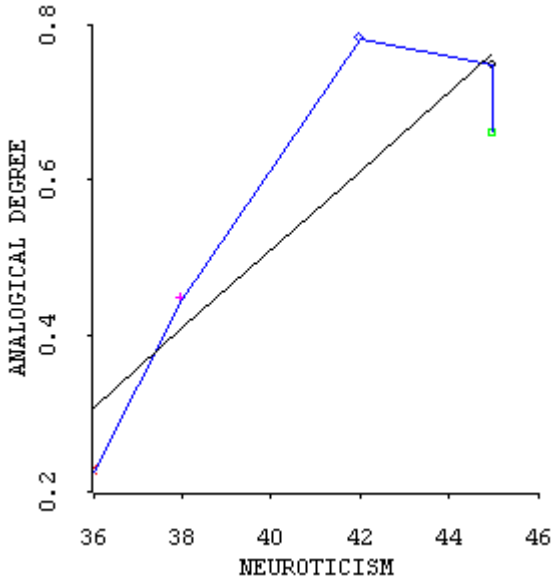

Figure 1: Analogical Degree (AD) is plotted vs. the Neuroticism (N) T score for each participant. Ordinary least squares fit is superimposed above data points indicating a strong positive correlation between AD and N.

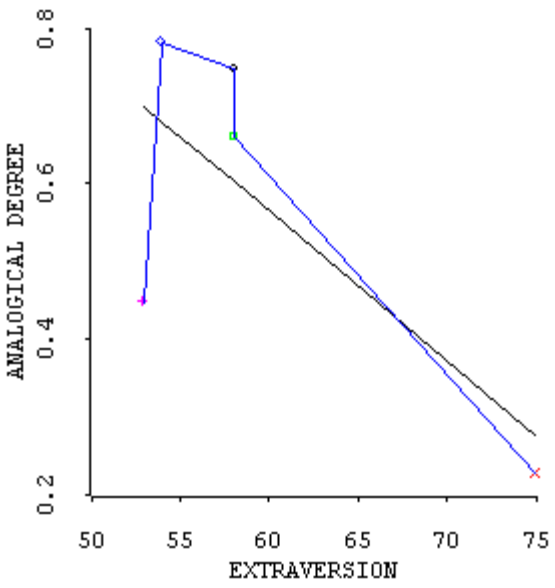

Figure 2: Analogical Degree (AD) is plotted vs. the Extraversion (E) T score for each participant. Ordinary least squares fit is superimposed above data points indicating a strong negative correlation between AD and E.

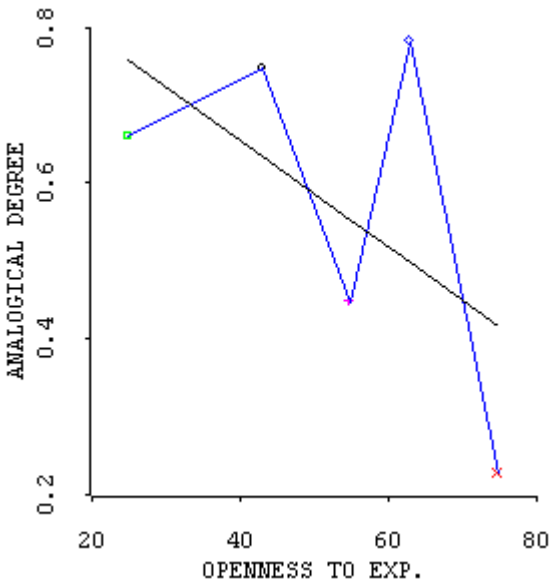

Figure 3: Analogical Degree (AD) is plotted vs. the Openness to Experience (O) T score for each participant. Ordinary least squares fit is superimposed above data points indicating a moderate negative correlation between AD and O.

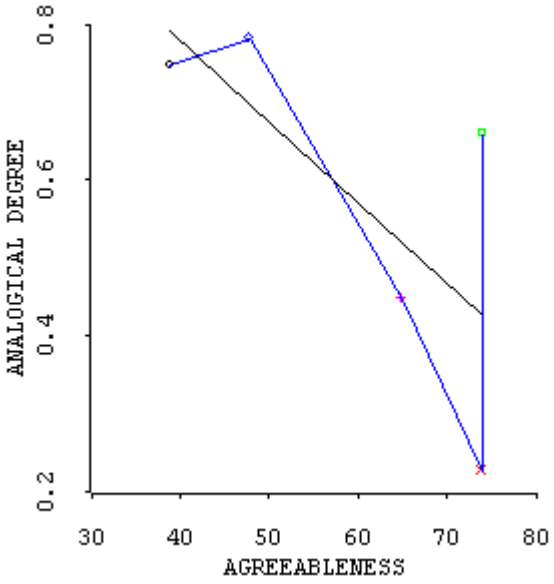

Figure 4: Analogical Degree (AD) is plotted vs. the Agreeableness (A) T score for each participant. Ordinary least squares fit is superimposed above data points indicating a strong negative correlation between AD and A.

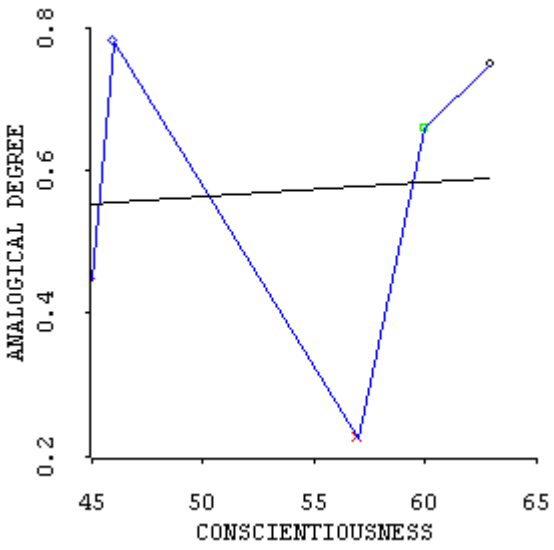

Figure 1: Analogical Degree (AD) is plotted vs. the Conscientiousness (C) T score for each participant. Ordinary least squares fit is superimposed above data points indicating a negligible correlation between AD and C.

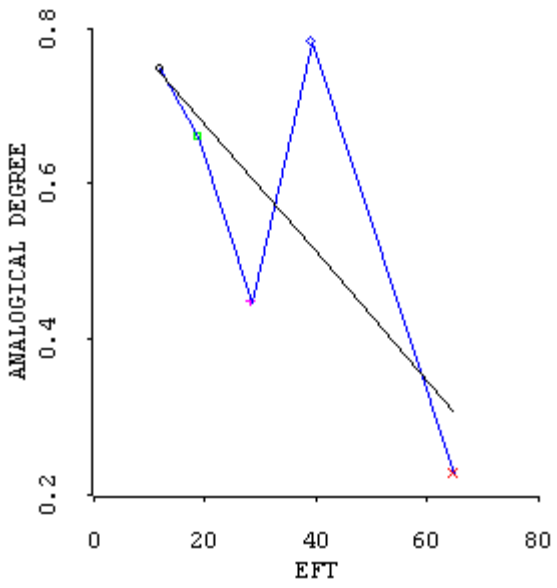

Figure 1: Analogical Degree (AD) is plotted vs. the EFT score for each participant. Ordinary least squares fit is superimposed above data points indicating a strong negative correlation between AD and EFT.

APPENDIX A

Background Questionnaire

Name: _____ Subject #: _____

Rank: _____

Age: _____

Total Years of Service: _____

Number of years in sea billet: (Total) _____

Last Sea Billet: _____

Time since last at sea (yrs or months) _____

Last Class of Ship: _____

Approximate Number of UNREPS (Circle One)

0-50 51-100 101-200 201-300 >300

NEO-FFI Answer Sheet

Sum the COLUMNS to obtain raw scores for N, E, O, A, and C.

Plot raw scores on facing page to obtain *T* scores.

SD D N A SA	SD D N A SA	SD D N A SA	SD D N A SA	SD D N A SA
1 4 3 2 1 0	2 0 1 2 3 4	3 4 3 2 1 0	4 0 1 2 3 4	5 0 1 2 3 4
6 0 1 2 3 4	7 0 1 2 3 4	8 4 3 2 1 0	9 4 3 2 1 0	10 0 1 2 3 4
11 0 1 2 3 4	12 4 3 2 1 0	13 0 1 2 3 4	14 4 3 2 1 0	15 4 3 2 1 0
16 4 3 2 1 0	17 0 1 2 3 4	18 4 3 2 1 0	19 0 1 2 3 4	20 0 1 2 3 4
21 0 1 2 3 4	22 0 1 2 3 4	23 4 3 2 1 0	24 4 3 2 1 0	25 0 1 2 3 4
26 0 1 2 3 4	27 4 3 2 1 0	28 0 1 2 3 4	29 4 3 2 1 0	30 4 3 2 1 0
31 4 3 2 1 0	32 0 1 2 3 4	33 4 3 2 1 0	34 0 1 2 3 4	35 0 1 2 3 4
36 0 1 2 3 4	37 0 1 2 3 4	38 4 3 2 1 0	39 4 3 2 1 0	40 0 1 2 3 4
41 0 1 2 3 4	42 4 3 2 1 0	43 0 1 2 3 4	44 4 3 2 1 0	45 4 3 2 1 0
46 4 3 2 1 0	47 0 1 2 3 4	48 4 3 2 1 0	49 0 1 2 3 4	50 0 1 2 3 4
51 0 1 2 3 4	52 0 1 2 3 4	53 0 1 2 3 4	54 4 3 2 1 0	55 4 3 2 1 0
56 0 1 2 3 4	57 4 3 2 1 0	58 0 1 2 3 4	59 4 3 2 1 0	60 0 1 2 3 4

N = _____ E = _____ O = _____ A = _____ C = _____

Have you responded to all of the statements? _____Yes _____No

Do not score if this response is marked "No." _____Yes _____No

Do not score if this response is marked "No." _____Yes _____No

NEO-FFI Question Sheet

1. I am not a worrier.
2. I like to have a lot of people around me.
3. I don't like to waste time daydreaming.
4. I try to be courteous to everyone I meet.
5. I keep my belongings clean and neat.
6. I often feel inferior to others.
7. I laugh easily.
8. Once I find the right way to do something, I stick to it.
9. I often get into arguments with my family and co-workers.
10. I'm pretty good about pacing myself so as to get things done on time.
11. When I'm under a great deal of stress, sometimes I feel like I'm going to pieces.
12. I don't consider myself especially "light-hearted."
13. I am intrigued by the patterns I find in art and nature.
14. Some people think I'm selfish and egotistical.
15. I am not a very methodical person.
16. I rarely feel lonely or blue.
17. I really enjoy talking to people.
18. I believe letting students hear controversial speakers can only confuse and mislead them.
19. I would rather cooperate with others than compete with them.
20. I try to perform all the tasks assigned to me conscientiously.
21. I often feel tense and jittery.
22. I like to be where the action is.
23. Poetry has little or no effect on me.
24. I tend to be cynical and skeptical of others' intentions.
25. I have a clear set of goals and work toward them in an orderly fashion.
26. Sometimes I feel completely worthless.
27. I usually prefer to do things alone.
28. I often try new and foreign foods.
29. I believe that most people will take advantage of you if you let them.
30. I waste a lot of time before settling down to work.
31. I rarely feel fearful or anxious.
32. I often feel as if I'm bursting with energy.
33. I seldom notice the moods or feelings that different environments produce.
34. Most people I know like me.
35. I work hard to accomplish my goals.
36. I often get angry at the way people treat me.
37. I am a cheerful, high-spirited person.
38. I believe we should look to our religious authorities for decisions on moral issues.
39. Some people think of me as cold and calculating.
40. When I make a commitment, I can always be counted on to follow through.
41. Too often, when things go wrong, I get discouraged and feel like giving up.
42. I am not a cheerful optimist.
43. Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement.
44. I'm hard-headed and tough-minded in my attitudes.
45. Sometimes I'm not as dependable or reliable as I should be.
46. I am seldom sad or depressed.
47. My life is fast-paced.
48. I have little interest in speculating on the nature of the universe or the human condition.
49. I generally try to be thoughtful and considerate.
50. I am a productive person who always gets the job done.
51. I often feel helpless and want someone else to solve my problems.
52. I am a very active person.
53. I have a lot of intellectual curiosity.
54. If I don't like people, I let them know it.
55. I never seem to be able to get organized.
56. At times I have been so ashamed I just wanted to hide.
57. I would rather go my own way then be a leader of others.
58. I often enjoy playing with theories or abstract ideas.
59. If necessary, I am willing to manipulate people to get what I want.
60. I strive for excellence in everything I do.

APPENDIX B

Experiment Protocol Summary

Protocol

1. Briefly Explain Investigation
2. Background data collection
3. Experimental Trial 1
4. Experimental Trial 2
5. Experimental Trial 3
6. Debrief

Experimental Trials

SUBJECT	TRIAL 1	TRIAL 2	TRIAL 3
A	NEO Inventory	EFT	Interview
B	NEO Inventory	Interview	EFT
C	Interview	NEO Inventory	EFT
D	EFT	NEO Inventory	Interview
E	EFT	Interview	NEO Inventory

APPENDIX C

Experiment Instructions

"The purpose of this experiment is to determine possible causal factors and variability in expertise. Results of this experiment and any of its sub-tests are no indication of ability, knowledge level, or intelligence. Results are completely confidential. Your participation is totally voluntary and you are free to conclude the experiment at any time. The experiment consists of four parts administered in a random order. The four parts consist of:

A short background questionnaire

A 60 question personality inventory

A short cognitive process inventory

An open ended interview dealing with an UNREP scenario

The experiment should take approximately an hour. Do you have any questions?"

Subject receives background questionnaire

NEO PI

"Please answer the following 60 questions as accurately and truthfully as possible. Your first impression or thought after reading the question should be your answer. Possible answers range from strongly disagree in the leftmost column to strongly agree in the rightmost column. There is no time limit. Do you have any questions? Please begin."

EFT

"I am going to show you a series of complex colored designs. I will then show you a simple form, which is contained, in that larger design. You will then be given the larger design again, and your job will be to locate the simple form in it. Here is a practice trial to illustrate how it is done."

Show practice complex figure (P-X) for 15 seconds. Cover it with simple form (P). After 10 seconds say: "I will now show you the colored design again and you are to find the simple form in it. As soon as you have found the simple form let me know, and start tracing the simple form with the stylus. When you are tracing, do not let the stylus touch the surface of the card." Expose complex figure again. Start timing from zero. As soon as subject says he sees the simple form, the examiner notes the time; if the subject traces the form incorrectly, the time is recorded as the solution for the practice item.

After the practice item say: "This is how we will proceed on all trials. In every case the simple form will be present in the larger design. It will always be in the upright position, so do not turn the card. There may be several of the simple form in the same design but you are to find and trace only one. Work as quickly as you possibly can, since I will be timing you, but be sure that the form you trace is exactly the same as the original simple form in shape, size, and proportions. As soon as you have found the form, tell me at once and then start to trace it. If you ever forget what the simple form looks like, you may ask to see it again, and you may do so as often as you like. If you are unable to locate the simple image within 3 minutes, we will move on to the next form. Are there any questions?"

Present the first complex figure and proceed as above on this and the remaining 11 test items. Never allow the simple and complex figures visible to the subject simultaneously. Time in accordance with:

1. The stopwatch is started from zero as soon as the simple form is removed and the subject is requested to locate and trace it in the complex figure.
2. As soon as the subject reports he sees the simple form, note the time but do not stop the watch If the subject's tracing is correct, note the time in column 3 of the data sheet. If the subject's tracing is not correct, say "No that is not it" and continue to let the watch run. Record the first reported time on the data sheet followed by an X. Record the time when the final time the subject reports and the tracing is correct.
3. If the subject has not found the object by 3 minutes say, "Let's try another" and turn to the next item. Record the solution time as 180" (F).
4. The subject may examine the simple form again if he forgets it. Stop the watch and place the simple form over the complex figure for no more than 10 seconds. When the 10-second period is up, remove the simple form, exposing the complex figure, and restart the watch. Record an S and time each time the subject is shown the simple form.

ORDER OF FIGURES FOR TEST

Complex Figure	Simple Form	Complex Figure	Simple Form
1	A	7	F
2	B	8	E
3	C	9	C
4	D	10	G
5	E	11	A
6	A	12	H

INTERVIEW

"This phase is a an unstructured interview. I am going to present you with an UNREP scenario, and I would like for you as the senior experienced officer to summarize how you would train an inexperience junior officer prior to the evolution. Please specifically concentrate on major milestones of the approach, key decisions required, and information sources for the decisions. The supplied paper is for you to organize your thoughts and record them for review. After the end, I will go back and give you the opportunity to change any priorities and add or remove any information. Are there any questions as to the purpose or goal?"

"The scenario is: You are on board your last ship underway in open ocean. It is 1300, seastate is 2, and visibility is to the horizon (approximately 20K yards). You are 1000 yds astern of the USNS Rappahannock on Romeo course (000) and speed (13kts). You have just dipped Romeo. Are there any questions?"

If asked:

All propulsion systems are up and ready.

One new unclassified surface contact. Unknown course and speed. 25000K bearing 045

Good comms on net of choice

Can approach on either side.

Wind from North at 6kts

Single swell from 000

If not covered, ask:

Which station do you prefer

Significance of venturi effect

When to break the ship (cut speed)

How often do you want range calls

What comms would be required

Do you consider GPS input vital

What is an appropriate amount of time for the approach

Criteria to start approach over

How does the NWP compare to approaches in real life

Once subject is done, say "Out of the milestones you listed, what are the 5 most crucial and list them in order of importance. What are the crucial inputs required to evaluate the successful completion of the listed milestones?"

"This concludes the testing and data gathering. Do you have any questions or feedback for me? Thank you for your time and cooperation."