

UAS Program Review – 2012

Ric Ferraro, Ph.D.

- At UND since 1992
- PhD in Experimental/Cognitive Psychology(1989) from University of Kansas
- Over 225 publications in the areas of aging, attention, neuropsychology, cognition, individual differences, human factors, executive function, autism, and neurodevelopment.

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- Long-standing interest in Human Factors
- Worked on projects dealing with Reading Text Without Eye Movements and Optimal Visual Display Formats in graduate school
- **Juola, J. F., Haugh, D., Trast, S., Ferraro, F. R., & Liebhaber, M. (1987). Reading with and without eye movements. In J. K. O'Regan & A. Levy-Schoen (Eds.), Eye movements: From physiology to cognition (pp. 499-508). Amsterdam: Elsevier North-Holland.**
- **Ferraro, F. R. (1989). Psychology of computer use: XV. Effects of display format on reading text from a CRT. Perceptual & Motor Skills, 69, 895-898.**

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- Since then I have continued to perform, collaborate with other colleagues and publish related human factors/aviation research
- Bartholomew, C. J., Jensen, W., Petros, T. V., Ferraro, F.R., Fire, K., Biberdorf, D., Fraley, E., Schalk, J., & Blumkin, D. (1999). The effect of moderate levels of simulated altitude on sustained cognitive performance. International Journal of Aviation Psychology, *9*, 351-359.
- Petros, T., Bridewell, J., Jensen, W., Ferraro, F. R., Bates, J., Moulton, P., Turnwell, S., Rawley, D., Howe, T., & Gorder, D. (2003). Post-intoxication effects of alcohol on flight performance after moderate and high blood alcohol levels. International Journal of Aviation Psychology, *13*, 287-300.
- Ferraro, F. R. (2009) Application of classic human information processing models to unmanned aircraft systems. Psychology Journal, *6*, 100-105.
- Ferraro, F. R., Butler, M., & Reckow, J. (2012). State/Trait anxiety, aviation and the frontal lobes. In A. S. Morales (Ed.), Trait anxiety (pp. 185-190). Hauppauge, NY: Nova Science Publications, Inc.
- Wuerges, I., Rygalov, V. Y., & Ferraro, F. R. (in press). Panic development mechanisms and preventive methods analysis. Advances in Space Research.

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- Since 2006, been involved in UND UAV Center of Excellence as part of Human Factors Team
- Main emphasis has been on:
 - (1) enhancing the understanding of human learning and instruction and
 - (2) develop methods to reliably define Air Force Remotely Piloted Aircraft (RPA) training and readiness requirements
- Dr. Petros will discuss these areas at length in his presentation

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- Additionally I have worked on other related projects relevant to UAS and these include the following:
- **1. Risk, Decision-Making and Information Processing**
- **2. Impact of Action Video Game Experience on Neurocognitive Performance**
- **3. Texting Dependence, Information Processing, and Psychological Health**
- **4. Processing Weather-Related Visual Information**
- **5. Assessment of a Motion Cueing Seat Device**

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- 1. Risk, Decision-Making and Information Processing
- Causee et al (International Journal of Aviation Psychology, 2011, 21, 217-234) showed that working memory updating, flight experience and impulsivity were associated with the relevance of weather-related decision making.
- **Butler, M., Ferraro, R., Petros, T., Lindseth, P. Lindseth, G., & Jensen, W. (2010). Impulse control, risk perception, and aviation experience. 51st annual meeting of the Psychonomic Society, St. Louis, MO. Abstracts of the Psychonomic Society, 51, 53 [ABSTRACT].**
- **Ferraro, F. R., Butler, M., & Reckow, J. (2012). State/Trait anxiety, aviation and the frontal lobes. In A. S. Morales (Ed.), Trait anxiety (pp. 185-190). Hauppauge, NY: Nova Science Publications, Inc.**

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- 1. Risk, Decision-Making and Information Processing-
Conclusions
- On three of the four risk perception indices the association with the Impulse-Control was positive and significant in those with extensive aviation experience (all r 's $> .36$, all p 's $< .05$) but were not significant in those without extensive aviation experience.
- Any risk perception training program in pilots would do well to include training on impulse control.

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- 2. Impact of Action Video Game Experience on Neurocognitive Performance
- A recent paper in Aviation, Space and Environmental Medicine (McKinley et al, 2011, 82, 635-642) suggests that cognitive skills learned via video game play transfers to novel environments and improves task performance in UAS tasks.
- **Holfeld, B., Cicha, R., Ferraro, R., Kvasager, M., Schweitzer, K., Johnson, B., & Heit, S. (2010). The impact of action video game experience on neurocognitive performance. 82nd Midwestern Psychological Association, Chicago, IL. Program of the 82nd Midwestern Psychological Association, 82, 139. [ABSTRACT].**
- **Holfeld, B., Cicha, R., & Ferraro, F. R. (under review). The relationship between action video game playing and executive function. American Psychological Association.**

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- 2. Impact of Action Video Game Experience on Neurocognitive Performance - Conclusions
- Examined whether prolonged video game playing could account for executive functioning differences among 212 undergraduate participants (ages 17 to 36) with varying degrees of video game experience.
- A series of hierarchical regression analyses were computed to examine whether video game playing (frequency and duration) predicted executive functioning after controlling for gender, age, education, depression, state and trait anxiety, and vocabulary.
- Video game playing frequency predicts greater impulsivity, greater levels of empathy, and lower levels of overall executive functioning, suggesting that some aspects of executive functioning may be negatively impacted by video game playing.

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- 3. Texting Dependence, Information Processing, and Psychological Health
- Chappelle et al (2011, AFRL-SA-WP-TR-2011-0002 Technical Report) showed that Predator and Reaper pilot and sensor duties are high-risk, high-demand jobs with cognitive, emotional, and personality trait characteristics critical for success. They offer up a model to use for successful pilot/sensor assessment and selection. Like videogame playing, texting is fast becoming more common place in our society.
- Our research group is showing that an over-reliance and dependence on texting not only negatively impacts executive function, and impulsivity but also increases symptoms of depression and anxiety. UAS missions are often long and time-consuming. Screening for text dependency (and the lack thereof) may be relevant in order to minimize cognition distractions but also reduce disruption to psychological, emotional and behavioral function.
- **Ferraro, F. R., Winger, A., Kreiger, M., Langseth, M., Weivoda, L., Palmiscno, J., Bishop, M., & Wulff, T. (in press). Text message dependence and impulsivity. In M. A. Cyders (Ed.), Impulsivity (pp. xxx-xxx). Hauppauge, NY: Nova Science Publications, Inc.**

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- 3. Texting Dependence, Information Processing, and Psychological Health-
Conclusions
- We gave 204 undergraduates the Self-Perceptions of Text Messaging Dependency Scale (SPTMDS) along with measure of depression, anxiety, vocabulary, and executive function to examine how texting impacts mental and physical health.
- As performance on the three sub-scales of the SPTMDS (Emotion Reaction, Excessive Use, Disruption of Relationships with text Messages) all increased (suggesting more dependence on texting and text messaging), self-rated health, depression, anxiety, and several measures of executive function also got worse.
- All three subtests of the SPTMDS correlated negatively with the Total Score of the EFl, suggesting that excessive text dependency appears to impact all major components of executive function.

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- 4. Processing Weather-Related Visual Information
- Weather-related aeronautical risk perception continues to be a relevant topic (Pauley et al, International Journal of Aviation Psychology, 19, 201-216) and these authors found that assessment of pilot risk perception is associated with adequate pilot selection and training.
- **Butler, M., Ferraro, F. R., Lindseth, G., Lindseth, P., & Petros, T. (2009). Executive function and weather-related risk: Applications to UAS pilots. North Dakota EPSCoR State Conference, Fargo, ND. Program of the ND EPSCoR State Conference [ABSTRACT], 1, 38 [ABSTRACT].**
- **Ferraro, F. R., Winger, A., Wunderlich, L., Wyrobek, K., Weivoda, L., Langseth, M., Kreiger, M., Wulff, T., Palmiscno, J., & Bishop, M. (under review). Orientation effects of weather words. Psychological Record.**
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- 4. Processing Weather-Related Visual Information -Conclusions
- One-hundred seventy-five college students read weather words presented in three different orientation formats (Normal upright, Rotated 90 degrees to the right, Movie Marquee).
- Response Times (RTs) to Movie Marquee format was slowest overall as compared to Normal and Rotated , suggesting that Normal or Rotated presentation of weather words is optimal (significantly faster response times) as compared to the Marquee format.
- Results have implications for how best to design information presentation formats as they relate to weather information.

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- 5. Assessment of a Motion Cueing Seat Device
- Recent submission of an NSF-MRI grant by Ferraro & Woodworth (2011) resulted in a revise/resubmit decision; purchase of this equipment was subsequently added to a DoD/DURIP grant currently under review.
- Use of a motion cueing seat with UAS pilots and sensors would be relevant as these individuals remain static during UAS flight. Involvement in motion cueing would likely reduce pilot/sensor complacency, thereby reducing potential errors, omissions, problems
- Kallus et al (International Journal of Aviation Psychology, 2011, 21, 135-152) found that training in motion-based cue perception would facilitate learning new skills for coping with perceptual illusions based on motion

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- Overall Conclusions
- Results from these studies have implications regarding how to enhance the understanding of human learning and instruction as well as how to develop methods to reliably define Air Force Remotely Piloted Aircraft (RPA) training and readiness requirements
- **1. Risk, Decision-Making and Information Processing**
- **2. Impact of Action Video Game Experience on Neurocognitive Performance**
- **3. Texting Dependence, Information Processing, and Psychological Health**
- **4. Processing Weather-Related Visual Information**
- **5. Assessment of a Motion Cueing Seat Device**