Tactile Interface To Improve Situational Awareness: Basic Localization Studies

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OBJECTIVE

- To determine limits of spatial resolution for a vibrotactile display on the abdomen, using two different tactor types while manipulating parameters of stimulation such as body site and tactor separation.

ACCOMPLISHMENTS

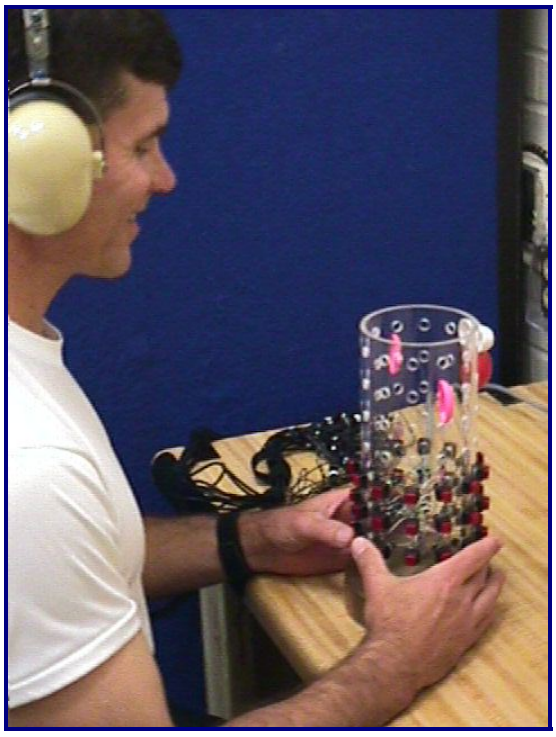
- Designed and developed independent software and hardware system for testing basic characteristics of vibrotactile localization on the abdomen;
- Conducted studies of man-machine performance using unique cylindrical keyboard, isomorphic to the user's body;
- Evaluated parameters of localization for 12-tactor FS-2 pneumatic flight system and 12-tactor electromechanical laboratory system;
- Documented the effects of manipulating the number of tactors in the tactile array, as well as the spatial and temporal characteristics of vibratory stimulation;
- Evaluated the effects of learning on localization performance with a 12-tactor array circling the abdomen;

PUBLICATIONS/ PRESENTATIONS

- Cholewiak, R. W., Rupert, A. H., & McGrath, B. J. (2000). *A tactile display for situation awareness: Applications to postural control for aging persons.* Presentation to the International Sensory Aids Conference, May 21-26, 2000, Exeter, England.
- Cholewiak, R. W., Collins, A. A., & Brill, J. C. (2001). *Spatial factors in vibrotactile pattern perception.* Paper at the Eurohaptics 2001 Conference, July 4, Birmingham, England.
- Cholewiak, R. W. (2002). *Vibrotactile Pattern Perception: Effects of Space, Place, and Age.* Presentation to Social Science Faculty, May 24, University of Mannheim, Mannheim, Germany.
- Cholewiak, R. W. (2002). *Tactile pattern perception: What and where did it happen?* Presentation at the Naval Aerospace Medical Research Laboratory Scientific Seminar Series, June 12, Pensacola, FL.
- Cholewiak, R. W., Brill, J. C., & Schwab, A. (2004). Vibrotactile localization on the abdomen: Effects of place and space. *Perception & Psychophysics, 66*, 970-987.

ASSOCIATES:

Research Assistants:
J. Christopher Brill, Anja Schwab, and Kristy Beede



Project Title: Tactile Situation Awareness System (TSAS) Development: Accuracy of Tactile Cueing for Attitude and Target Awareness
Roger W. Cholewiak, Ph. D., P. I.
with J. Christopher Brill, Anja Schwab, and Kristy Beede

TSAS Localization	**2000**				**2001**				**2002+**			
Milestone (including Studies**, Presentations)**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**Ss**
Initial IRB Submission/Approval		***X***	***X***	***X***								
Tactile localization software & hardware preparation						***X***	***X***		***X***		***X***	
Presentation to ISAC'00, Exeter, BG		X										
Research Assistant Brill hired			X									
Pilot studies of cylindrical keyboard feasibility (11 Ss)					X							11
Pilot studies of vibrotactile localization of 12 sites around the abdomen (10 Ss)						X						10
Vibrotactile localization of 12 sites around the abdomen with 2 tactor types and 2 body positions (12 Ss)							X					12
Effect of learning on vibrotactile localization of 12 sites around the abdomen over 10 sessions (12 Ss)								X				12
Vibrotactile localization of 6 or 8 sites around the abdomen with 1 tactor type (12 Ss)									X			12
Presentation to Psychology Faculty, Mannheim GE,										**X**		
Vibrotactile localization of 7 sites in a hemicircle around the sides or across the front or back of the abdomen (12 Ss)										X		12
Vibrotactile thresholds on the abdomen (Schwab at Princeton Cutaneous Lab) (4 Ss)											X	4
Presentation to Psychonomic Society, Kansas City											**X**	
Vibrotactile localization of 8 sites vertically encoded on the back of the body (12 Ss)											X	12
Vibrotactile localization of 12 sites vertically encoded on the back of the body (12 Ss)											X	12
Presentation to Psychonomic Society, Vancouver BC											**X**	
Publication of results: Cholewiak, R. W., Brill, J. C., & Schwab, A. (2004). Vibrotactile localization on the abdomen: Effects of place and space. *Perception & Psychophysics, 66*(6), 970-987.												**X**
Total number of subjects tested (not including c. 11 whose data were unusable)												***97***