

Sharon MB Joines, PhD  
Associate Professor  
Department of Graphic Design and Industrial Design  
College of Design  
North Carolina State University

#### Education

BS Industrial and Systems Engineering, 1992, North Carolina State University, Raleigh, USA  
MS Industrial and Systems Engineering, 1996, North Carolina State University, Raleigh, USA  
PhD Industrial and Systems Engineering, 2002, North Carolina State University, Raleigh, USA

#### Professional experience

Graduate Research Assistants 1992-1993, 1995-96, NCSU, Dept of Industrial Engineering  
Graduate Teaching Assistant 1993-1994, NCSU, Dept of Industrial Engineering  
Instructor 1994-1995, NCSU, Dept of Industrial Engineering  
Research Assistant 1995-2002, North Carolina Ergonomics Resource Center  
Director of Research 2002-2005, Ergonomics Center of North Carolina  
Visiting Assistant Professor 2004-2005, NCSU, Dept of Industrial Engineering  
Visiting Associate Professor 2005, NCSU, Dept of Industrial Design  
Assistant Professor 2006- 2012, NCSU, Dept of Industrial Design  
Associate Faculty 2006 - present, NCSU, PhD in Design  
Director 2008 - present, Research in Ergonomics and Design Lab  
Associate Professor 2012- present, NCSU, Dept of Graphic and Industrial Design  
Affiliate Faculty 2012- 2015, UNC-NCSU Rehabilitation Engineering Center  
Director of Graduate Programs, 2013 - present, Industrial Design, NCSU

#### Professional activities

##### Scholarly and professional honors

2002 NCSU nominee for the IIE Pritsker Dissertation Award  
2011 Keynote address for the 42nd annual Conference of the Association of Canadian Ergonomist, Ontario  
2011 Invited speaker, Advances in Task Lighting in Office Environments, National Ergonomics Conference and Exposition  
2013 Invited speaker, Design Catalyst for Innovation: Human Centered Design Fuels Transformation, Industrial Design Society of America Southern District Conference, Raleigh  
2013 Keynote address for 13°ErgoDesign, Innovation for All: Design research team, toolbox, and tact, USIHC, June, Natal, Brazil.  
2013 Invited speaker for 13°ErgoDesign, Research for Universal Design: Understanding Context and Stakeholders; Leveraging Collaboration and Co-creation, USIHC, June, Natal, Brazil.  
2013 College of Design nominee, Alumni Association Graduate Professor Award  
2013 College of Design nominee, Alumni Association Outstanding Research Award  
2013 Invited speaker for Industrial Design Society of America Educators Conference, Sponsored Studies as an Educational Tool: Corporate Relationships in Design Education, Chicago, IL.  
2013 ID nominee for College of Design, University Faculty Scholars Program  
2014-2019, NC State University Faculty Scholar  
2015 Invited: Eastman Innovation Conference presentation and ideations session facilitator  
2015 Keynote: Universal Design: the Inclusive Student Union. 2015 Association of College Unions International Regional III Conference, Raleigh, NC.  
2016 Invited Plenary Speaker: Across disciplines and cultures: recommendations supporting transdisciplinary collaboration. KSEA NC South-Atlantic Regional Conference, Raleigh  
2016 Invited speaker, HFES ErgoX 2016 Conference, Anaheim, CA.  
2016 Outstanding Graduate Faculty Mentor Award in the area of the Humanities and Design  
2016-2017 Alumni Association Outstanding Research Award

2017 Member of NC State's Academy of Outstanding Faculty Mentors  
2017 Member of NC State's Research Leadership Academy

#### Professional service on campus

##### University

Evaluation of Teaching Committee (2006 – 2009)  
Working Group on Faculty Development (2007- 2008)  
Institutional Review Board for Human Subjects Protection (2008-present)  
Judge, NCSU Annual Graduate Student Research Symposium (2014, 2015, 2016)  
Graduate Assessment Task Force (2015)

##### College

Co-Chair, Universal Design Symposium, College of Design, NCSU, Raleigh, NC, March 20-21, 2015  
PhD Program, Courses and Curriculum Committee (2014-present, Chair 2015)  
Editor, Design research and methods journal (2010 – 2014)  
Search committee for PhD program director (2008, 2015), for ID department head (2009, 2011), for Design research faculty member (2012-2013), for Design history faculty member (2013), for ID faculty member (chair, 2015-2016)  
Support service area, ID liaison, GDID department (2011 – present)  
Undergraduate program coordinator, executive committee GDID department (2010 – 2011)  
NASAD accreditation review team, logistics (2010 – 2011)  
Dean's Research task force (2010 – present), Strategic planning task force (2011 – present)  
Design thinking task force (2010 – 2011)  
Scholarship, research, extension, and engagement (2006 – present; Chair, 2008 – 2012)  
RED Lab (2006 – present)  
CUD (2006 - 2012)

#### Professional service off campus

Industrial Design Society of America (2012 – present)  
Design Research Society (2010 – present)  
Human Factors and Ergonomics Society (2003 – present)  
Safety Technical Group  
Chair (2010-2012), Chair-elect (2008-2010)  
Industrial Ergonomic Technical Group  
Practitioners' award committee chair (2004-2005)  
Product Design Technical Group  
Aging Technical Group  
Webmaster (2006)  
Technical Program Chair (2016)  
Board of directors, NC Warehousing Education and Research Council (2010-2015)  
Guest Editor for Design for All Newsletter, a publication of the Design for All Institute in India  
Editorial activities  
Associate Editor, *Ergonomics in Design*  
Referee for *Applied Ergonomics*  
Referee for *Human Factors*  
Referee for *International Journal of Industrial Ergonomics*  
Referee for *Journal of Electromyography and Kinesiology*  
Referee for *Design Studies*  
Referee for *Experimental Aging Research*  
Referee for *Ergonomics*  
Guest Editor for *Design for All Newsletter*  
Review tenure package for Florida International University, Georgia Tech

Teaching

**IE 452 Ergonomics**

- ID 445 Human Center Design
- ID 202 Sophomore Industrial Design Studio
- ID 400 Advanced Industrial Design Studio: Human Centered Design
- ID 500 Advanced Industrial Design Studio: Design Research
- ID 581 Final Project Preparation
- ID 582 Design Methods
- ID 588 Final Design Studio
- DDN 795 Special Topics Lecture - Ergonomics Research Methods for PhD students
- DDN 830 Special Topics in Human Centered Design
- DDN 893 Doctoral Supervised Research
- DDN 810 PhD Colloquia – Research Management

PhD Committees

Student Name	Degree	Title	Role
1. Hyunjee Kim	PhD DN, Fall 2012	Older adults and designing pleasurable environments	Chair
2. Beau Bowers	PhD College of Adult and Higher Education, 2016	Effective environment for learning for adult students	Member
3. Wenjiao Wang	PhD DN, Spring 2014	Interface design for older adults	Chair
4. Liu, Swien	PhD DN, Spring 2013	Using electromechanical conceptual references to design for older adults	Chair
5. Anne Porterfield	PhD in Textile and Apparel Management, Spring 2015	Redesigning costumes for Ballet companies	Member
6. Constanza Miranda	PhD DN, Summer 2013	How, in the use of the design process, do multidisciplinary teams incorporate visual language to mediate contested terminologies?	Member
7. Zhenmin Hou	PhD DN	Exer-games and the Elderly	Co-Chair
8. Engin Kapkin	PhD DN, Summer, 2015	Meaning Attribution Model of Product Forms: A Holistic Approach	Chair
9. Hongyang Liu	PhD DN,	<i>Not submitted</i>	Chair
10. Mengchao Lai	PhD DN,	<i>Not submitted</i>	Chair
11. Lixiao Huang	PhD Psychology	<i>Not submitted</i>	Member
12. Lesley-Ann Noel	PhD DN,	<i>Not submitted</i>	Co-Chair
13. Kendall Mckenzie	PhD DN,	<i>Not submitted</i>	Chair

Masters Committees

Student Name	Degree	Title	Graduated	Role
1. Kelly Myers	MID	Ergonomic gyn exam table design	SPR, 06	Member
2. Glenwood Morris	MID	Bentwood chair	SPR, 06	Member
3. Kristen Meador	MS IE	Ultrasound grip assessment	SPR, 06	Co-Chair
4. Allison Anderson	MS IE	Learning curve development for	SPR, 06	Member

5.	Leigh McClure	MS IE	alternative keyboard designs Effect of warm-up and time of day on lower extremity posture and kinematics during lifting	SPR, 06	Member
6.	Laura Rowe	MID	Tobacco exhibit	SPR, 07	Member
7.	Jamie Vodvarka	MID	Using regionally seated new product development with application in accessible, safe medical packaging	Fall, 08	Chair
8.	Janell Moore	MID	Development of a low cultural impact humanitarian design method with applications in Afghanistan	SPR, 09	Chair
9.	Brendan Rodgers	MID	Textile characteristics and shoe design	SPR, 09	Member
10.	Sara Jane Dawson	MID	Breast thermography screening equipment	SPR, 09	Member
11.	Julie Rhodes	MID	Product characteristics and pleasure	SPR, 10	Member
12.	Andrew Peeler	MID	Rugby shoe design	Fall, 09	Chair
13.	Rachel Wilson	MID	Portion control and plate design	Fall, 09	Chair
14.	Jessica Konawicz	MID	Brand expansion for Paul Frank Inc.	Fall, 09	Member
15.	Kent Harris	MID	Capturing wind energy in turbulent conditions	Fall, 09	Chair
16.	Taylor Leaf	MID	Creation of a minimal, long-lasting, root-respecting footwear brand	SPR, 10	Co-Chair
17.	Shimon Shmueli	MID	User centered innovation course	SPR, 10	Member
18.	Peter Carrasquillo	MID	Furniture for the new American renter	SPR, 10	Member
19.	Tyler Gibson	MID	A novel approach to contextual process awareness and automation	SPR, 10	Chair
20.	Kathryn Asad	MID	Applied Research in Kitchen Tool Design for Low-Vision and Blindness	SPR, 10	Member
21.	Lyndsey Blackmon	MID	Addressing Elitism within an Interior Design Business Model	FALL, 10	Member
22.	Michelle Proctor	MID	fARMOR	FALL, 10	Member
23.	Zhemin Hou	MID	Artis	FALL, 10	Member
24.	Tyler Thompson	MID	Women's lacrosse protective gear: Challenging existing head, face, and eye protection	FALL, 10	Chair
25.	Timothy Bennett	MID	Design for Duration: Exploring Human-Product Relationships to Sustain Product Attachment	SPR, 11	Chair
26.	David Bryan	MID	Nature's Genius: A Science Center Exhibition about Bio-mimicry	SPR, 11	Chair
27.	Sean Coleman	MID	Electric Freedom: Exploration and Development of an Iconic Electric Vehicle	SPR, 11	Member
28.	Josephine Dorsett	MID	A Solution for Handling Kitchen Organic Waste	SPR, 11	Co-Chair
29.	T. Hampton Freeman	MID	Stimulating Imaginative Thought in Children through Play in Adaptive Environments	SPR, 11	Co-Chair
30.	Paulina Jaurequi	MID	Studying spaces, creating places. Case study: A bench design contest, as an illustration of interdisciplinary work	SPR, 11	Co-Chair
31.	Engin Kapkin	MID	Feedback Based Representation of Electricity Consumption in U.S.	SPR, 11	Co-Chair

		Residential Houses		
32. Matthew Gilbride	MID	Living in Beta	SPR, 11	Member
33. Tanuja Ajay Patwardhan	MID	Workstation Design for Precision Task-Sitting Postures During the Watchmaking Process	FALL, 12	Chair
34. Michael Falk	MID	Exhibit Design	FALL, 12	Co-Chair
35. Mary Elizabeth Miller	MID	Co-Active Design	FALL, 12	Co-Chair
36. Pu Gu	MID	Musical Instrument Design	FALL, 12	Co-Chair
37. Christina Harrington	MID	Inclusive Participatory Design: A Methods Study Assessing Effective Participatory Techniques for Children with Autism	SPR, 13	Chair
38. Lu Lu Wang	MID	The Effect of Communication in Extreme Situations	SPR, 13	Chair
39. Mengchao Lai	MID	Challenges Facing English as Second Language (ESL) Learners	SPR, 13	Chair
40. Anna Smith	MID	Shoe design	SPR, 13	Member
41. Audrey Watanabe	MID	Children's toy design	SPR, 13	Member
42. Brian Franson	MID	Drowsy Driver, Keeping the Shift Worker Awake	SPR, 14	Chair
43. Wesley Hare	MID	Sketching the user experience for creating next generation graphics tablets	SPR, 14	Chair
44. Warren Ginn	MID	Materials and Processes Education for an Undergraduate Industrial Design Curriculum	SPR, 14	Chair
45. David Edison	MID	Long Distance Truck Cab Re-deign	SPR, 15	Co-Chair
46. Haidy El-Borombaly	MID	Children's Restaurant Highchair Re-Design	SPR, 15	Chair
47. Jimena Vergara	MID	Universal Design of a Auditory Experience for the Deaf	SPR, 15	Chair
48. Jennifer Peavey	MID	Materials Strategy	SPR, 16	Chair
49. Byungsoo Kim	MID	Car Interior Redesign: UD guideline Development	SPR, 16	Chair
50. William Bradley	MID	System of Designers and Entrepreneur's Interactions	SPR, 16	Chair
51. Alek Walker	MID	Bee Hive Redesign to address Dwindling Bee Population: Walker Bee Farm	SPR, 16	Chair
52. Jeffrey Chen	MID	Design of a Control System for Aquaponics	SPR, 16	Member
53. Nicholas Grey	MID	Remote Immersive RC Car Racing Experience	SPR, 16	Member
54. Chang Cao	MID	Design of Eye Fatigue Mitigation Device	SPR, 17	Chair
55. Maria Catalina Salamanca Mendez	MID	Redesigning Developmental Dysplasia of the Hip Orthotic Device	SPR, 17	Chair
56. Penghui Jiang	MID	Learning Photography Basics: Development of an Virtual Educational Experience	SPR, 17	Chair
57. Matt Skeen	MID	Next Generation Mountain Bike Design	SPR, 17	Member
58. Nancy Rekhelman	MID	Interventions supporting Shelters and Adoptive Pet Owners to Reduce Dog Returns	SPR, 17	Member

#### Refereed Journal Articles, In Print

- (1) Sommerich, Lavender, Evans, Sanders, Joines, Lamar. Radin Umar, Yen, Li, Nagavarapu, and Dickerson, Collaborating with cardiac sonographers to develop work-related musculoskeletal disorder interventions, Accepted for publication in *Ergonomics* (2016).
- (2) Sommerich, Lavender, Evans, Sanders, Joines, Lamar. Radin Umar, Yen, and Park, Collaborating with Mammographers to Address Their Work-Related Musculoskeletal Discomfort, Accepted for publication in *Ergonomics* (2015).
- (3) Joines, James, Liu, Wang and Dunn, Adjustable task lighting: Field study assesses the benefits in an office environment, *Work*. 51 (2015) 471–481.
- (4) Rhodes, J., Laffitte, B., and Joines, S. (2011). Aesthetic Judgment and Vision: Our Associated Emotional Response to Objects, *Design Principles and Practices: an International Journal*, 5 (4), 07-622.
- (5) Wilson, R., & Joines, S. (2010). Design and obesity: The effects of tableware on eating behaviors. *Design Principles and Practices: An International Journal*, 4(6), 97-114.
- (6) Kim, H., & Joines, S. (2010). Obesity simulation suit: Subjective and physiological assessment. *Design Principles and Practices: An International Journal*, 4(4), 263-274.
- (7) Joines, S. (2010). Enhancing quality of life through universal design. *NeuroRehabilitation*, 25(4), 313-326.
- (8) Anderson, A., Mirka, G., Joines, S., & Kaber, D. (2009). Analysis of alternative keyboards using learning curves. *Human Factors*, 51(1), 35-45.
- (9) Joines, S., Sommerich, C., Mirka, G., Wilson, R., & Moon, S. (2006). Low-level exertions of the neck musculature: A study of research methods. *Journal of Electromyography and Kinesiology*, 16(5), 485-497.
- (10) Lutz, T., Starr, H., Smith, C., Stewart, A., Monroe, M., Joines, S., et al. (2001). The use of mirrors during an assembly task: A study of ergonomics and productivity. *Ergonomics*, 44(2), 215-228.
- (11) Joines, S., & Sommerich, C. (2001). Comparison of self-assessment and partnered-assessment as cost-effective alternative methods for office workstation evaluation. *International Journal of Industrial Ergonomics*, 28(6), 327-340.
- (12) Sommerich, C., Joines, S., & Psihogios, J. (2001). Effects of computer monitor viewing angle and related factors on strain, performance, and preference outcomes. *Human Factors*, 43(1), 39-55.
- (13) Sommerich, C., Joines, S., Hermans, V., & Moon, S. (2000). Use of surface electromyography to estimate neck muscle activity. *Journal of Electromyography and Kinesiology*, 10(6), 377-398.
- (14) Glasscock, N., Turville, K., Joines, S., and Mirka, G. (1999). The effect of personality type on muscle coactivation during elbow flexion, *Human Factors*, 41(1).

#### Refereed Journal Articles In Review

- (1) Kim and Joines, Design of an aging simulation kit, submitted to *International Journal of Industrial Ergonomics*
- (2) Kim and Joines, A Participatory Design Approach for Investigating Preferences in Ideal Indoor Public Spaces for Inter-generational Groups - Older People and Children, submitted to the *International Journal of Design*

#### Journal Articles, In Preparation

- (1) Peeler and Joines, Novel Wait Staff Tray: Simulated meal delivery and extended field test, in preparation for *Design Studies*.
- (2) Joines, Liu, and Vercoe, Grip Span and Aging: Changes in Grip Force, Muscle Activity and Discomfort for *Applied Ergonomics*.

## Book Chapters

- (1) Joines and Payne, (accepted in 2016). Chapter 47: Universal Design. *In Occupational Therapy* (7<sup>th</sup> edition). Elsevier.
- (2) Joines, James, and Suarez. (2010). Evaluation of an Intervention to Reduce Upper Extremity Pain in Ultrasound. In Duffy (Ed.), *Advances in Human Factors and Ergonomics in Healthcare*. (pp. 114-123). Taylor & Francis.
- (3) Young, Joines, and Payne, (2009). Toward Universal Design. *In Occupational Therapy and Physical Dysfunction* (pp 429-450). Elsevier.

## Reviewed Conference Proceedings with Oral Presentation

- (1) Vogel, Davis, Evans, Hooper, Jameson, Joines, Littlejohn, Tyler, Interdisciplinary Teams in Intelligence Analysis: An Experiment at NC State, *Society for the Social Studies of Science meeting*, 11-14 November 2015.
- (2) Inter-organizational Multilevel Interdisciplinary Collaboration: Lessons Learned from a Natural Experiment at the Laboratory of Analytic Sciences. 2015.
- (3) Kim, Liu, and Joines, Design for Empathy: Research expanding experience suit for educational purposes, *Industrial Design Society of America, Educators Conference*, Seattle, WA, Aug. 19-22, 2015.
- (4) Kapkin and Joines, From Systems Thinking to Design Criteria: Synthesis Through Visualization, *Learn x Design*, Chicago, IL, June, 2015.
- (5) Joines, Kapkin and Valenziano, Respectful language for design research: Practical recommendations for respectfully addressing and writing about people with disabilities, *Industrial Design Society of America, Educators Conference*, Austin, TX, Aug. 13-16, 2014.
- (6) Kapkin and Joines, Wisdom of a design research ninja: Lessons learned from fieldwork, *Industrial Design Society of America, Educators Conference*, Austin, TX, Aug. 13-16, 2014.
- (7) Ginn and Joines, Asking the employer about M&P: Is Materials and Processes education still important?, *Industrial Design Society of America, Educators Conference*, Austin, TX, Aug. 13-16, 2014.
- (8) Joines and Hoyle, Reinforced Ergonomic Vest for Aviation Maintainers, *51st Annual SAFE Symposium*, Reno, NV, October 14-16, 2013.
- (9) Harrington, Brown, Wang and Joines, Firefighter Vital Signs Monitor Development, *Proceedings of the Human Factors and Ergonomics Society 57th Annual Meeting*, San Diego, CA, September 30-October 4, 2013.
- (10) Wang, Liu, Valenziano, and Joines, Wall Outlet Height Recommendations: Contrasting Ambulatory and Wheelchair Users' Data, *Proceedings of the Human Factors and Ergonomics Society 56th Annual Meeting*, Boston, MA, October 22-26, 2012.
- (11) Liu and Joines, Developing a Framework of Guiding Interface Design for Older Adults, *Proceedings of the Human Factors and Ergonomics Society 56th Annual Meeting*, Boston, MA, October 22-26, 2012.
- (12) Harrington and Joines. Assessing User Experience with Crutch Use: A Review of the Literature, *Proceedings of the Human Factors and Ergonomics Society 55th Annual Meeting*, Las Vegas, NV, September 19-23, 2011.
- (13) Vin, Liu, Wang, and Joines. Assessment of the Redesigned Asian Wok Handles, *Proceedings of the Human Factors and Ergonomics Society 55th Annual Meeting*, Las Vegas, NV, September 19-23, 2011.
- (14) Wang, Joines, and Vance. Ergonomics and the Built Environment: Recommendations for Wall Outlet Height, *Proceedings of the Human Factors and Ergonomics Society 55th Annual Meeting*, Las Vegas, NV, September 19-23, 2011.
- (15) Sommerich, Lavender, Suanders, Lamar, Evans, Joines, and Yen. Participatory Ergonomics Applied to Sonographers' Work, *Proceedings of the Human Factors and Ergonomics Society 55th Annual Meeting*, Las Vegas, NV, September 19-23, 2011.

- (16) Umar, Sommerich, Evans, Lavender, Suanders, Yen, Joines, and Lamar. Ergonomic Interventional Design of an Articulating Arm for Echocardiography Application: Front-End Design and Pilot Study, Proceedings of the Human Factors and Ergonomics Society 55th Annual Meeting, Las Vegas, NV, September 19-23, 2011.
- (17) Carroll, K., Joines, S., and Gorga, R. Assessing student attitudes within the NCSU Textile Products for People with Disabilities program. *Include Conference*. Royal College of Art, London, UK, April 18-20 2011.
- (18) Rhodes, J., Laffittee, B, and Joines, S. “Aesthetic Judgment and Vision: Our Associated Emotional Response to Objects”. *International Conference on Design Principles and Practices*. Feb 2-4, 2011.
- (19) Sommerich, Carolyn, Sesek, Richard, Stone, Nancy, Joines, Sharon, Smith-Jackson, Tonya, and Wiebe, Eric. Visualizing Innovative Uses of Technology and Devices for Engaging College Students in Active Learning. HFES conference, San Francisco, CA, September 27-October 1, 2010.
- (20) Sommerich, C., Lavender, S., Suanders, L., Lamar, S., Evans, K., Joines, S., and Yen, W. Participatory Ergonomics Applied to Mammographers’ Work. HFES conference, San Francisco, CA, September 27-October 1, 2010.
- (21) Joines, Liu, and Vercoe, Grip Span and Aging: Does the grip strength-span relationship change with age, HFES conference, San Francisco, CA, September 27-October 1, 2010.
- (22) Joines, James and Suarez, Evaluation of an intervention to reduce upper extremity pain in ultrasound, 3rd International Conference on Applied Human Factors and Ergonomics (AHFE), Miami, Florida, July 17-20, 2010.
- (23) Kim and Joines, Obesity Simulation Suit: Subjective and Physiological Assessment International Conference on Design Principles and Practices. 2010.
- (24) Wang, Joines, and Vance, Effort and Design Choices in the Built Environment: Assessing Wall Outlet Height and Reach Envelopes, International Conference on Design Principles and Practices. 2010.
- (25) Wilson and Joines, Design and Obesity: The Effects of Tableware on Eating Behaviors, International Conference on Design Principles and Practices. 2010.
- (26) Joines, James, and Moon, Intervention for Reducing Musculoskeletal Disorders: Evaluation of Physical Risk Factors for Ultrasound Technologists, Poster Presentation, American Occupational Health Conference, San Diego, CA, April 24-29, 2009
- (27) Kim and Joines, Aging Visitors: Assessing Museum Layout and Objects as Affording Experience, International Conference on Inclusive Museums, National Museum of Ethnology, Leiden, the Netherlands, 8-11 June 2008.
- (28) Joines and Vercco, Toward Universal Design of Tactile Exhibits: Participant Preferences, Visual Capabilities, Age, and Model Form, International Conference on Inclusive Museums, National Museum of Ethnology, Leiden, the Netherlands, 8-11 June 2008.
- (29) Anderson, Mirka, Joines and Kaber, Learning Curve Analysis, HFES conference, 2007.
- (30) Joines and Hooper, Infusing Human Centered Design Research into the Studio: Knowledge Building through Quantification of Design Choices, International Conference on Design Principles and Practices. 2008.
- (31) Joines, Sommerich, Mirka, Wilson, and Moon, Identification of measures sensitive to fatigue development associated with low-level exertions of the neck musculature and the effects of age, HFES conference. 2002.
- (32) Sommerich, Joines, and Psihogios, Factors to consider in selecting appropriate computer monitor placement, IEA/HFES conference. 2000.
- (33) Joines and Sommerich, A method for cost effective anthropometric data collection in a large office environment, IEA/HFES conference. 2000.
- (34) Sommerich, Joines, and Psihogios, Effects of VDT viewing angle on user biomechanics, comfort and preference, HFES conference. 1998.
- (35) Glasscock, Turville, Joines, and Mirka, The effect of personality type on muscle coactivation during elbow flexion, HFES conference. 1997.



Conference presentation, abstract refereed

- (1) Rhodes, Laffitte, and Joines. Aesthetic Judgement + Vision: Our Associated Emotional Response to Objects, International Conference on Design Principles and Practices. Rome, Italy, 2011.
- (2) Joines, James and Suarez. Evaluation of an intervention to reduce upper extremity pain in ultrasound, 3rd International Conference on Applied Human Factors and Ergonomics (AHFE), Miami, Florida, 2010.
- (3) Kim and Joines. Obesity Simulation Suit: Subjective and Physiological Assessment, International Conference on Design Principles and Practices. Chicago, IL, 2010.
- (4) Wang, Joines, and Vance. Effort and Design Choices in the Built Environment: Assessing Wall Outlet Height and Reach Envelopes, International Conference on Design Principles and Practices. Chicago, IL, 2010.
- (5) Wilson and Joines. Design and Obesity: The Effects of Tableware on Eating Behaviors, International Conference on Design Principles and Practices. Chicago, IL, 2010.
- (6) Joines and Vercco. Toward Universal Design of Tactile Exhibits: Participant Preferences, Visual Capabilities, Age, and Model Form, International Conference on Inclusive Museums. Leiden, Netherlands, 2008.
- (7) Kim and Joines. Aging Visitors: Assessing Museum Layout and Objects as Affording Experience, International Conference on Inclusive Museums. Leiden, Netherlands, 2008.
- (8) Joines and Hooper. Infusing Human Centered Design Research into the Studio: Knowledge Building through Quantification of Design Choices, International Conference on Design Principles and Practices. Miami, FL, 2008.

Poster, abstract refereed

- (1) Benny, Joines, Kapkin, and Mikitka. Universally Designed for Work: Assimilating Universal Design into the Warehouse Workforce, Universal Design Symposium, Raleigh, NC, March 20-21, 2015.
- (2) James, Joines, Dunn, Liu, and Wang. Assessment of the Benefits of Adjustable Task Lighting in Office Environments, Poster Presentation, Ergonomics & Human Factors conference, Stoke Rochford, UK, 2011.
- (3) Joines, James, and Moon. Intervention for Reducing Musculoskeletal Disorders: Evaluation of Physical Risk Factors for Ultrasound Technologists, Poster Presentation, American Occupational Health Conference, San Diego, CA, 2009.

Funded Training and Research Grants (Principal Investigator Only)

Funding evident in RADAR reporting system

COLLEGE OF DESIGN (2006- 2016) External Funds Total	\$993,863	24
Lab for Analytic Sciences (NSA) Total	\$279,286	5
*COLLEGE OF DESIGN (2006- 2016) RADAR Total	<b>\$ \$1,273,149</b>	
Pending Proposals (including pre-proposals)	\$310,736	3
Non-funded Projects	\$14,116,520	17

Funding not evident in RADAR reporting system

Internally (CUD, ID, GID, ECNC) Funded	\$118,820	8
Externally (joint with ECNC) Funded	\$12,895	3
**Non-RADAR Total	<b>\$173,715</b>	

	Proposed, not-funded	\$ 12,738,493	10
	†Total gifts:	\$52,000	2
<b>Total External Source Funded (*RADAR, **Non-RADAR, †Gifts)</b>		<b>\$ 1,498,864</b>	

## 1. Externally funded projects, evident in RADAR

### **Durable goods manufacturing ergonomics intervention**

(07/13/2004 - 10/31/2007)

\$24,832

This project determined if the implementation of engineering interventions reduces workers' exposure to physical risk factors for musculoskeletal disorders (MSDs) in the durable goods manufacturing sector. An intervention was provided for 10 individuals performing wiring braiding for co-axial cables (or highly similar work tasks). There was a comparison group of 10 who did the same work but was not provided with the intervention. Evaluation of physical risk factors was performed before and after the intervention was installed for both groups. The interventions were successful and adopted by the majority of female and smaller stature participants.

(Funding Source: Centers for Disease Control & Prevention)

### **Radiological technician ergonomic intervention**

(07/14/2004 - 11/30/2007)

\$23,338

This project determined if the implementation of engineering interventions reduces workers' exposure to physical risk factors for musculoskeletal disorders (MSDs) in the medically-related occupation of radiological technologist. An intervention was provided for at least 6 workers performing the same (or highly similar work tasks). All interventions were rejected during the final field study.

(Funding Source: National Institute for Occupational Safety & Health)

### **Research truck assessment**

(02/02/2006 - 09/30/2006)

\$21,224

This project assessed four reach trucks during use. Four types of data were collected to assess the reach trucks designs: muscle activity, activation forces, cab dimensions, and subjective assessments of product usability. These data sets characterized the effort required during use.

(Funding Source: NACCO Material Handling Group, Inc.)

### **Office chair assessment**

(03/01/2006 - 09/15/2006)

\$11,375

This project assessed five office chairs during use. Participants used the chairs while performing their normal work for the Division of Motor Vehicles for a minimum of four weeks before data is collected. Four types of data were collected to quantify effort required during use to assess the chair designs: muscle activity, discomfort surveys, and subjective assessments of product usability.

(Funding Source: Ergo Genesis)

### **Insulated cooler assessment**

(04/12/2006 - 09/15/2006)

\$5,915

This project assessed four portable insulated coolers during use. Participants used the coolers to carry loads while walking over flat surfaces and up and down stairs. Four types of data were collected to quantify effort required during use to assess the cooler designs: muscle activity, discomfort surveys, and subjective assessments of product usability.

(Funding Source: California Innovations)

**Designing musculoskeletal disorder interventions for imaging technologist**

(09/01/2008 - 08/31/2011)

\$60,334

The goal of this project is to identify risk factors for work-related musculoskeletal disorders and develop interventions/solutions for radiology professionals, particularly radiologic technologists (sonographers, radiographers, and mammographers). The project will include problem identification, ideation, prototype development and testing.

Prime--National Institute for Occupational Safety &amp; Health R01OH009253 -

\$777,000

(Funding Source: Ohio State University)

**Universal design of tactile exhibits with touch activated, descriptive audio for aquariums**

(10/01/2006 - 10/01/2007)

\$19,527

This project evaluated individual's interactions with tactile models of marine creatures that were created for the project. With a special focus on people who experience chronic blindness and low vision, our input was to assure that the strategies and best practices would be usable by people who have newly acquired vision loss, i.e., those who have not yet acquired the ADL coping strategies. A universal approach would assure the effective and competent use by the widest range of people possible.

(Funding Source: RAF Models, Inc. (Prime—US-DED))

**Insulated cooler assessment**

(02/19/2007 - 08/30/2008)

\$10,928

This project was a follow-up study to the insulated cooler assessment completed in 2006. Based on the findings of our first project the client redesigned their products producing 9 alternatives. This project evaluated 9 insulated coolers in two sizes: 3-16 can size and 6-30 can. The assessment utilized established electromyographic and force sensor measures and protocols to characterize muscle activity and pressure distribution. This evaluation included using human subjects, collecting muscle activity from the neck, shoulder and low back muscles and pressure distribution data from the load distribution between feet. Participants' evaluations of the straps, load distribution and cooler comfort during use were compared to the quantitative muscle activity data.

(Funding Source: California Innovations)

**Accessible and universal housing technical support for North Carolina**

(07/01/2006 - 06/30/2009)

\$150,000

As our population ages, and with the inherent change in physical abilities that come with aging, responsive environments becomes critical to individuals' independence. This project provided design assistance, education, and training on accessible and universal housing to the housing industry, with a focus on multifamily housing. Accessible housing that is responsive to an individual's needs is still in very short supply, especially for the clients of DVR programs.

(Funding Source: NC Department of Health &amp; Human Services (DHHS))

**Ergonomics research packaging evaluation**

(11/30/2007 - 01/15/2009)

\$49,943

This project assessed the ergonomic characteristics associated with alternative packaging and dispenser designs. Participants opened packages with alternative materials and styles to evaluate key aspects of the effort required while opening the package. Five types of data were collected: effort required during using, handling or opening the package or dispenser; muscle activity of the upper extremity; force application (between the finger tips and the package); discomfort, and subjective assessments of package usability and effort.

(Funding Source: Mead West Vaco Corp.)

**Accessible and universal housing technical support for North Carolina**

(07/01/2009 - 06/30/2011)

\$100,000

This project promoted and disseminated publications highlighting the research completed in partnership with the NC State College of Design RED Lab. The Center for Universal Design in partnership with the RED Lab investigated issues facing our growing disabled population along with other varying physical and psychological difficulties facing North Carolina citizens in the workplace and at home. The research and publications

highlighted the importance of universal design assisting people's transition from interdependence to independence in the workplace and at home.

(Funding Source: NC Department of Health & Human Services (DHHS))

**Human Scale: Ergonomic lighting assessment**

(01/01/2010 - 12/31/2011)

\$11,940

This project will assess the ergonomic and/or calculated utility power consumption benefits of task lighting in an office environment using a control/intervention experiment design. The project will generate and pilot test an on-line survey; recruit participants (50 in intervention group, 50 in control group); schedule participants for data collection; collect baseline data using on-line comfort survey (whole body discomfort, eye fatigue, perception of control, light meter data); and data entry, analysis and documentation.

(Funding Source: Humanscale)

**Reinforced Vest for Aircraft Wing and other Enclosed Area Access**

(01/01/2012 – 08/31/2013)

\$143,779

This project, sponsored by the Defense Safety Oversight Council (DSOC) Acquisition and Technology Programs Task Force, has the objective to evaluate and refine existing prototype reinforced vests to improve access and related comfort, safety and productivity during entry into enclosed areas of aircraft wings and fuel tanks. A marketable prototype with potential patent protection and production capability is the ultimate goal. Preliminary trials have demonstrated user acceptance and increased productivity, with personnel reporting that they are able to work in subject areas for 1 -2 hours in relative comfort. Previously, work access was limited to about 20 minutes and often followed by significant localized bruising and discomfort.

(Funding Source: Concurrent Technologies Corporation (US-DOD))

**Industry Collaborative Research and Development Project**

(01/01/2013 – 06/30/2013)

\$27,968

At the request of Matthew Gilbride, of JLG, the Department of Graphic Design and Industrial Design is proposing a project to be conducted in the Spring semester of 2013 in order to: A. Provide industrial design students an opportunity to learn/practice the process/methods of comprehensive user research and create innovative solutions based on their research findings and the professional input from JLG. B. Discover problems of JLG's existing product offerings and generate conceptual recommendations to enhance the efficiency and experience of the end users. C. Expand the breadth and depth of the research and scholarship of faculty in the Department of Graphic Design and Industrial Design. D. Foster a long-term collaborative relation between JLG and the Department of Graphic Design and Industrial Design at NC State University.

(Funding Source: JLG Industries, Inc)

**Understanding the Use of Packaging Systems For Cold Chain Pharmaceuticals**

(01/01/2013 – 05/15/2013)

\$18,750

Confidential.

(Funding Source: Eastman Chemical Company)

**RFP-7 Development of an Innovative Thermal Electric Generator on Plastic Substrates for Market Launch**

(08/31/2014 – 08/31/2014)

\$29,832

Confidential.

(Funding Source: Eastman Chemical Company)

**EMN-13-F-S-07: Exploration of Acetate Tow and Acoustical Control**

(01/31/2014 – 06/30/2014)

\$38,640

Confidential.

(Funding Source: Eastman Chemical Company)

**Design of Simple Smart Self-Injection**

(08/15/2014 - 01/15/2014)

\$25,000

This project concerns improving the overall design of insulin self-injection device concepts, with the possibility that ultimately new designs may emerge. Design factors to be considered include those that govern patient use experience (e.g. device-user interface).

(Funding Source: BD Technologies)

**Breast Simulator Project, Phase 1**

(01/01/2015- 7/01/2015)

\$17,432

This proposal will focus on phase 1 for the Motion Bra Study in which a graduate industrial design studio will develop concepts for capturing and simulating breast and torso motion during athletic activity for half of the spring semester in 2014. The problem descriptions and relevant questions, as articulated by Hanes Brand Initiative champion, are paired with focused salient questions for studio investigation, proposed methods of investigation, and criteria for this project's success. The studio administrative structure is presented with the project budget and a schedule for proposed activities with associated deliverables. (Funding Source: Hanesbrands, Inc)

**Roll On Core: Intervention Development To Mitigate Repeating Film Impressions From Tape**

(01/01/2015- 06/15/2015)

\$34,684

The loss of premium performance film due to visible distortions created by adhesive tape used in roll to roll processing will be addressed by developing a combination of interventions which may include changes in film attachment to the core, adhesion to the core, and core characteristics. The combination of changes may require a change in equipment used in the take up process, roll to roll process parameters and core specifications.

(Funding Source: Eastman Chemical Company)

**Breast Simulator Project, Phase 2**

(06/15/2015- 8/31/2016)

\$64,451

This project will develop a breast motion simulator to categorize (light, med, heavy) control of Sport Bras and Active wear for level of motion resulting from standard movements of the system.

(Funding Source: Hanesbrands, Inc)

**BSH Home appliance**

(08/15/2015- 2/15/2016)

\$15,000

The project focused on improving the user experience with Bosch dishwashers. BSH is interested in the dish clean-up that does not involve the dishwasher. BSH is additionally interested in the impact of certain up-coming technologies on our dishwasher products.

(Funding Source: Bosch Home Appliances)

**Ethnographic Research and Concept Development for Accessible Shower Trays**

(08/15/2015- 2/15/2016)

\$25,000

2016 Fall Academic Course Design Project: The project focused on improving the user experience with zero threshold shower pans for high end bath designs. Design development required meeting building codes and was to include addressing multiple stakeholders needs including plumbers, installers, property owners, shower users and care givers, and cleaning staff.

(Funding Source: Victoria + Albert)

**Ethnographic Research and Concept Development for Nursing Side Car Design**

2017 Spring Academic Course Design Project: The project focused on improving the user experience with infant hospital bassinet designs. To improve mother-infant bonding (by supporting skin touch and breast feeding), the design development was to meet FDA design requirements and to include addressing multiple stakeholders needs including mothers (including those having had C-section deliveries), infants, nurses, doctors, technicians and mother's partners.

(Funding Source: UNC-CH, NC TraCS Spring 2017 Project)

## 2. Internally funded projects, evident in RADAR

### Descriptions of projects internally funded, evident in RADAR

Internally funded projects supported students to work on projects or cover data collection costs.

#### **Effect of age on grip varying span and texture**

(07/15/2007 - 07/14/2008)

\$5,925

The primary objective of this investigation was to quantify the effect age on grip span and grip texture while performing precision tasks. The secondary objective was to examine the effect of age on muscular fatigue development and recovery with age. This research represents a forward thinking approach to resolving design questions via quantitative investigations and served as a seed project for a larger project funded by the Ergonomics Center of NC on the 'Effect of age on grip texture'.

(Funding Source: NCSU Faculty Research & Professional Development Fund)

#### **Establish a program to develop textile products for people with disabilities (TPPD)**

(07/01/2009 - 06/30/2010)

\$8,000

Roughly 19% of the total U.S. population is living with some type of disability (U.S. Census Bureau, Census 2000 Summary). The project had the following objectives: 1) engage teams of students directly with disabled individuals to develop textile products that meet their needs, and 2) develop a central web-based information portal for people with disabilities to find textile products. Faculty in the College of Textiles and the College of Design partnered with the local groups that represent people with disabilities, including the North Carolina Victims with Disabilities Task Force and constituents of the Center for Universal Design. Multiple (~5) interdisciplinary teams were introduced to a group of wheelchair users involved in active sports, such as basketball, to capture their needs. The teams developed and built textile prototypes to be evaluated by the users. The seed grant provided the basis to grow TPPD into a major outreach and engagement program that is the central source for 1) information, 2) hosting student competitions, 3) textile product development, and 4) companies commercializing products.

(Funding Source: NCSU University Extension Grant Program)

#### **LAS DO3 Task Order 2.1 Collaboration - Joines**

(03/31/2014 - 12/31/2014)

\$50,170

Collaboration research, user psychology, and future state processing.

(Funding Source: National Security Agency, Laboratory for Analytic Sciences)

#### **LAS DO5 Joines Task 5.6 Collaboration**

(05/15/2015- 12/15/2015)

\$53,469

Collaboration team, collaboration research, and metrology team.

(Funding Source: National Security Agency, Laboratory for Analytic Sciences)

#### **LAS DO 6.1 Joines - Behavior Modeling**

(01/01/2016- 12/31/2016)

\$106,267

DO6 Collaborative research, user experience, collaborative report generation and audience specific reporting.

(Funding Source: National Security Agency, Laboratory for Analytic Sciences)

#### **LAS DO7 Joines - 3.7.7 Collaboration**

1/01/2017 through 12/31/2017

\$57,259

DO7 Structured Analytic Techniques development: Collaborative research, user experience, collaborative report generation and audience specific reporting in the Intelligence Community for a SCADA setting.

(Funding Source: National Security Agency, Laboratory for Analytic Sciences)

### **Descriptions of externally funded projects, not evident in RADAR**

#### **Pilot work for assessing novel armor load distribution device**

(2009) \$4,950

This project identified dependent measures suitable for differentiating soldiers' load carriage while wearing a novel armor load distribution device compared to current equipment.

(This project was jointly proposed through the ECNC, (Prime--Angel Armor))

#### **Pressure mapping documentation**

(2009) \$1,845

This project documented the difference in pressure distribution based on seatpan cushion material and contour.

(This project was jointly proposed through the ECNC, (Prime--ErgoGenesis))

#### **Personal assistive suits: Literature and market review**

(2008) \$6,100

This project reviewed existing literature and commercially available personal strength augmentation suits. Such wearable augmentation devices, though having been designed to assist in rehabilitation or to support the disabled, may have applications for industrial and manufacturing jobs such as the automotive industry.

(This project was jointly proposed through the ECNC (Prime--Toyota Motor Mfg.))

### **3. Internally funded projects, not evident in RADAR**

#### **Descriptions of projects internally funded, not evident in RADAR**

Internally funded projects supported students to work on projects or cover data collection costs.

#### **Lower extremity component to aging simulation suit**

(08/15/2010 - 05/15/2011) \$3,110

This project developed and prototyped components that can be worn on the lower extremities to simulate characteristics of aging for young individuals. These components were to augment the RED Lab's existing aging simulation suit (for the torso, neck and upper extremities). The utility of such a suit is to support an empathetic design process by providing designers with experiences similar to the challenges faced by individuals with abilities different from their own.

(Funding Source: Department of Graphic Design and Industrial Design)

#### **Assessing crutch user experience**

(01/15/2010 - 05/15/2011) \$3,110

This investigation identified the challenges faced by individuals during short term crutch use using a literature, market review, user survey and interview. The focus of the investigation centered on the challenges in users' activities of daily living which would benefit from intervention development.

(Funding Source: Department of Graphic Design and Industrial Design)

#### **Effect of age on grip texture**

(8/15/2008 - 6/15/2010) \$50,000

Texture is an important part of our daily interaction with objects such as tools, jars, bottles, and many other things. Many people rely on using tools for their livelihood. Constant interaction with tools and their grip surfaces can lead to fatigue and injury. Other factors such as inexperience with a tool or symptoms of aging can affect the user and what grip may be best for them. The purpose of this investigation was to investigate effects of alternative grip textures on the user when opening small and large bottles and while using hand tools (pliers and hammers) and age group.

(Funding Source: Ergonomics Center of NC)

**Development and testing of an aging simulation suit for the upper extremity**

(8/15/2007 - 8/14/2008)

\$6,500

To our knowledge, even though some designers and researchers in universities or companies use an aging simulation suit to understand how older adults are feeling and get feedback into what it may feel like to be older, there is no study comparing the relationship between a young person wearing a simulation suit and an older person has been reported. Thus, this study evaluated a suit for the upper body that was designed to simulate the physical experience of being an older person.

(Funding Source: Center for Universal Design)

**Development and testing of an obesity simulation suit for the torso and upper extremity**

(8/15/2007 - 8/14/2008)

\$4,900

This study designed and evaluated a suit for the upper body that simulates the physical experience of being an overweight adult by adding weight to the torso and upper extremities and adding girth to the torso using a padded vest.

(Funding Source: Center for Universal Design)

**Lab testing, literature and market reviews**

(8/15/2007 - 8/14/2008)

\$25,000

This study assessed effort associated with the use of products and processes of interest to the clients of the Ergonomics Center of NC and to perform literature and market reviews of intervention solutions.

(Funding Source: Ergonomics Center of NC)

**Lab based evaluation of ergonomics probe rings**

(8/15/2007 - 12/15/07)

\$1,200

This study evaluated the addition of flexible rings to ultrasound transducers to determine the feasibility of pursuing this as a possible solution for reducing the required grip force and resulting upper extremity pain among sonographers performing ultrasound scans. Participants simulated ultrasound scans on an anthropomorphic manikin while using the intervention and without to assess loading reduction of the upper extremity.

(Funding Source: Industrial Design Department)

**Lab based testing of radiology tech interventions (breast support, panus support, and probe covers)**

(8/15/2006 - 8/14/2007)

\$25,000

This study evaluated interventions for radiological technologists to determine the feasibility of pursuing this as a possible solution for reducing the required grip force and resulting upper extremity pain among sonographers performing ultrasound scans. The interventions (breast and panus supports and ultrasound transducer probe covers) were designed to aid the radiological technologists while scanning obese patients by support excess adipose tissue or providing increased gripping surface such that additional forces required to scan through such tissue is minimized. Participants simulated ultrasound scans on an anthropomorphic manikin while using breast and panus supports and ultrasound transducer probe covers and without to assess loading reduction of the upper extremity.

(Funding Source: Ergonomics Center of NC)

**Inter-Disciplinary Activities**

- (1) Industrial Engineering – MS committee co-chair for Kristen Meador
- (2) Industrial Engineering – MS committee member for Allison Anderson
- (3) Industrial Engineering – MS committee member for Leigh McClure
- (4) Biomedical Engineering - sponsored chair assessment class project for Seth Hanson
- (5) Biomedical Engineering - sponsored Neck Motion Monitor project for Jessica Stahl
- (6) Biomedical Engineering - sponsored rehabilitation engineering project for special needs students at Yates Mill Elementary for Allison Williams
- (7) Occupational Medicine (Duke University) – Tamara James “Ergonomic Interventions for Radiology Technologists” (NIOSH)



- (8) Occupational Medicine (Duke University) – Tamara James “Ergonomic Assessment of Task Lighting in an Office Environment” (HumanScale)
- (9) Occupational Medicine (Duke University) – Tamara James “Probe Ring Ergonomic Intervention for Sonographers”
- (10) Textile Products for People with Disabilities group – College of Textiles, current
- (11) Education, Engineering and Design Task Force – Colleges of Engineering and Education, current
  - (a) “Engineering by Design”, PI: Young, Robert E. Industrial Engineering, NSF, \$12,499,172 5-year proposal, submitted on 08/20/09
- (12) Industrial Engineering, Ergonomics Center of North Carolina – supported 10 proposals and 3 research assessments and 3 investigations (6/01/07 – present)
- (13) Industrial Engineering, IE 544 – Occupational Biomechanics, Host and Facilitate Bio-Instrumentation Lab in RED Lab (10/05/09) for Dr. Glasscock
- (14) Letter of Intent submitted “EFRI-SEED - Interdisciplinary Evaluations of Composite Material Design and Testing Related to Human Health in Building Systems & Occupant Usage” by Hamouda (COT) for Emerging Frontiers in Research and Innovation 2010 with Abrams (COD), Gillian (CHASS), and Joines (COD)
- (15) Chair, Design Workshop, RED Lab, Eastman, November 11, 2014.
- (16) Co-Chair, Engaged Scholarship (CCT) Workshop, LAS, April 14-15, 2015.

## Extension and Engagement

### Articles in Trade Publications & Technical Reports

- (1) Ayoub, Del Vecchio, and Joines, “An analysis of the risks of cumulative trauma disorders in P.C. assemblers, operators and maintenance personnel using an expanded product comparison methodology”, IE-NCSU Technical Report 93-1.
- (2) Joines and Ayoub, “Design for assembly: an ergonomics approach” *Industrial Engineering*, **27(1)**, p42-46, 1995.
- (3) Sommerich and Joines, “Review of the literature with respect to the work relatedness of musculoskeletal disorders of the neck and upper back”, prepared for the Occupational safety and health administration invited review March 21, 1999. Federal register, Ergonomics program: Proposed rule, part B of Appendix I, A review of biomechanical and psychophysical research on risk factors associated with upper extremity disorders, details laboratory and psychophysical studies as well as the value of using biomechanical modeling to estimate risk associated with low-back and upper-extremity disorders.
- (4) Joines, “Identifying ergonomic hazards in the office environment”, *ErgoTalk* **5(2)**, 1999.
- (5) Joines, “Techno talk: using the lumbar motion monitor to simulate design modifications to a standard nail gun”, *ErgoTalk* **6(2)**, 2000.
- (6) Joines, “The aging workforce goes under the microscope”, *The Source* **1(1)**, 2002.
- (7) Joines and Sommerich, “Low-level exertions of the neck musculature: a study of research methods, fatigue development, and effects of age”, IE-NCSU Technical Report 02-02.
- (8) Joines, “Child-focused solutions: childcare facility deploys ergonomics for the benefit of children”, *ErgoSolutions* **1(6)**, 2003.
- (9) Joines, Covalla, Dickens, and Hoyle, “Ergonomics of the office environment – 2003”, IE-NCSU Technical Report 03-03.
- (10) Joines, S., “Executive ergonomics takes a brake”, *ErgoSolutions, Leverage*, **2(6)**, pp. L10.
- (11) Vercoe A., Laffitte, B., and Joines S., “Incorporation of Universal Design Principles in the Development of a Kangaroo Care Simulator for use in Neonatal Incubator”, *Design for All Newsletter - Student Work Edition*, 11 (2), joint publication between Design for All Institute of India and Design For All Foundation, Barcelona, Spain, p12-32.
- (12) Cherry, A., Shah, N., and Joines S., “Tribute to Ronal Mace”, *Design for All Newsletter*, 6(4), Design for All Institute of India, p3-8.
- (13) Peeler, A., and Joines S., “Product redesign of wait staff tray: Considering Muscular effort, posture, and universal design”, *Design for All Newsletter*, 6(4), Design for All Institute of India, p9-20.

- (14) Carrasquillo, P., Leaf, T., Rhodes, J., Rodgers, B., Shah, N., and Joines S., "Product redesign of grocery basket: Considering Muscular effort, pressure distribution, and user acceptance", *Design for All Newsletter*, 6(4), Design for All Institute of India, p21-30.
- (15) Asad, K., and Joines S., "Universally designed baby bath station", *Design for All Newsletter*, 6(4), Design for All Institute of India, p42-51.
- (16) Valenziano and Joines. People First Language for Researchers, to appear in *Design Research and Methods Journal*, 1(2), 2011.
- (17) Joines and Valenziano. Universally Designed Communications for Researchers, to appear in *Design Research and Methods Journal*, 1(2), 2011.
- (18) Valenziano and Joines. The Numbers: Why UD?, to appear in *Design Research and Methods Journal*, 1(2), 2011.
- (19) Valenziano and Joines. An Introduction to the Design Research and Methods Journal, *Design Research and Methods Journal*, 1(1), 2011.
- (20) Yu and Joines. Carrying Objects, *Design Research and Methods Journal*, 1(1), 2011.
- (21) Yu and Joines. Proper Grips, *Design Research and Methods Journal*, 1(1), 2011.
- (22) Yu and Joines. Workspace Layout, *Design Research and Methods Journal*, 1(1), 2011.
- (23) Valenziano and Joines. Principles of Universal Design Poster, *Design Research and Methods Journal*, 1(1), 2011.
- (24) Valenziano and Joines. Principles of Universal Design Quick-Reference, *Design Research and Methods Journal*, 1(1), 2011.

#### Public Service

- (1) Ergonomics Expo, NC Ergonomics Resource Center, Raleigh, NC,
  - (a) Presentation: "Establishing priorities through office evaluation", December, 1998.
  - (b) Presentation: "Office ergonomics: the purchasing challenge", December, 1999.
  - (c) Presentation: "Research activity highlights", December, 2001.
- (2) National Ergonomics Conference and Expo, Las Vegas, NV
  - (a) "How to make applied ergonomic research part of your successful program", December, 2002.
  - (b) "Ergonomic interventions for ultrasound technicians", November, 2007.
- (3) America Society of Safety Engineers
  - (a) "Safety and the aging workforce", Triad Chapter of American Society of Safety Engineers, Greensboro, NC, 2006.
  - (b) "Material handling: highlighting ergonomics", NC Chapter of American Society of Safety Engineers, Winston-Salem, NC, 2003.
  - (c) "Ergonomic material handling: changes in philosophies", Triad Chapter of American Society of Safety Engineers, Winston-Salem, NC, 2003.
- (4) Human Factors and Ergonomics Society Carolina Chapter
  - (a) "Research at the Center (ECNC)", Raleigh, NC, October, 2003.
  - (b) "Fatigue development associated with low-level exertions of the neck musculature and the effects of age", Raleigh, NC, November, 2003.
  - (c) "Research in ID at the RED Lab", Raleigh, NC, April, 2008.
  - (d) "Developing Human Centered Solutions: Industrial Design and Ergonomics in the Design Process", Cary, NC, August, 2009 – joint meeting with the Industrial Design Society Carolina Chapter.
- (5) NC Assistive Technology Expo
  - (a) 'Office ergonomics for everyone', Raleigh, NC, December 2005.
  - (b) 'Creating your home workspace, Raleigh, NC, December 2009.
- (6) Presentation: "Ergonomic Material Handling", Carolina STAR Conference, 2003.
- (7) Presentation: "Implications for the aging worker in food processing", National Safety Conference for the Poultry Industry, Hilton Head, SC, 2004.

- (8) Presentation: “Ergonomics follows the body”, NEOCON, Chicago, IL, 2005.
- (9) Presentation: “Ergonomics and Design”, Art Institute, Charlotte, NC, 2005 .
- (10) Presentation: ‘Office ergonomics for everyone’, Assistive Technology Expo, Raleigh, NC, December 2005.
- (11) Workshop: “Advanced Topics: The aging workforce”, Ergonomics Center of North Carolina, Raleigh, NC, December, 2005.
- (12) Presentation Wake County Elementary School:
- (a) “Anthropometry and statistical distributions for elementary school students”, Spring, 2006.
  - (b) “Design and human errors”, Spring, 2006.
  - (c) “The musculoskeletal system and human capabilities” Fall, 2006.
  - (d) “Industrial design, engineering and ergonomics for elementary school students”, Spring, 2007.
- (13) IIE Applied Ergonomics Conference
- (a) Presentation
    - “Facility ergonomics: optimizing the entire office equation”, Orlando, FL, March, 2003.
    - “Ergonomic Seating Solutions: Recent research and case studies”, Orlando, FL, March, 2004.
    - “The Aging workforce”, Orlando, FL, March, 2004.
    - “Reactions to an Obesity Simulation Suit”, Reno, NV, March, 2009.
  - (b) Panel Master Ergonomist at IIE Applied Ergonomics Conference
    - Upper extremity analysis, Orlando, FL, March, 2003.
    - Aging Workforce, Orlando, FL, March, 2006.
    - Aging Workforce, Dallas, TX, March, 2007.
    - Aging Workforce, Orlando, FL, March, 2008.
    - Obesity in the Workforce, Reno, NV, March, 2009.
  - (c) Workshop at IIE Applied Ergonomics Conference
    - “Ergonomics and the Aging Population”, Dallas, TX March, 2007.
    - “Ergonomics and the Aging Population”, Orlando, FL March, 2008.
  - (d) Benchmarking session and presentation
    - Benchmarking in Mfg and Aging Worker, Dallas, TX March, 2007.
    - Benchmarking in Mfg and Aging Worker, Orlando, FL March, 2008.
- (14) Presentation: “Ergonomics in product design”, Innovation Product Design (IPD) Lab, Textiles and Management Design Course, TE/ID Bus 565, December 2002, Fall 2006, Fall 2007.
- (15) Presentation: “Anatomy, muscle physiology and ergonomic design” Expanding Your Horizons Conference, NCSU, March, 2007.
- (16) Presentation: “Research at the RED Lab”, Industrial Ergonomics Training Workshop, Ergonomics Center of NC, Raleigh, NC, October, 2007, April, 2008, October, 2008, February, 2009, October 2009, February, 2010, October, 2013, February, 2014, July, 2014, February, 2015, and July 2015; Hanesbrand Inc., March, 2014; NCSU Forever Club Alumni, April 4, 2014.
- (17) Presentation: “Writing Opportunities created in ID 445: Human Centered Design”, Brown Bag Luncheon, Campus Writing and Speaking Program, Raleigh, NC, November 5, 2008.
- (18) Presentation: “Research at the RED Lab”, Design in Context, D 292 B, NCSU, February, 2009, November 14, 2013.
- (19) Presentation: “Ergonomics and Design Research”, Brown Bag Luncheon, Department of Psychology, Raleigh, NC, February 25, 2009.
- (20) Presentation: “Developing Human Centered Solutions: Studio and Sponsored Research” Sonography Ergonomics Committee, Duke University, Durham, NC, October 28, 2009.
- (21) Workshop: “Physical Characteristics of the Aging Customer”, MeadWestvaco, November 4, 2009 (\$1,500)
- (22) Meeting with Dow Corning to discuss aging population needs in the home focusing on slips, falls, packing, robotics and activities of daily living, 3/2/2010.
- (23) Presentation: “Ergonomics in product design”, Textiles Engineering Senior Design Course, TE 401, Spring 2010 & Spring 2011.

- (24) Presentation: “Collaboration in generative intervention design: Meeting the needs of imaging technologists”, Leaders Council, College of Design, NCSU, Raleigh, NC, November 5, 2011.
- (25) Presentation: “Probe grip and breast support during echo scans”, Sonography ergonomics committee, Duke University, Durham, NC, July 27, 2011.
- (26) Presentation: “Access to innovation: Leveraging the principles of human centered design”, Joint UNC-NCSU BME Rehabilitation Engineering Center Seminar, Raleigh, NC, February 3, 2013.
- (27) Presentation: “Universal Design and Rehab Engineering”, Johns Hopkins University, Baltimore, MD, April 29, 2014.
- (28) Presentation: “Industrial Design Process for Innovation: User Center Development Blending Research, Scholarship and Community”, Chancellor’s visit, April 1, 2014.
- (29) Joines and Hoyle, Reinforced Ergonomic Vest for Aviation Maintainers, DoD Acquisition ESOH IPT, Tuesday, November 19, 2013. Crystal City.
- (30) Presentation: “NCSU MID: Research and Scholarship in Industrial Design”, Appalachian State University, November 19, 2013. Boone NC.
- (31) Presentation: “Technical Understanding of Human Factors: Aging and prehension, strength, dexterity, hand motions, hand sizes”, Child Resistant Blitz Event, MeadWestvaco, November 7, 2013, Richmond VA.
- (32) Presentation: “Status and Transition of Reinforced Ergonomic Vest for Maintainers”, Naval Systems Air Command, Naval Air Station Patuxent River, Thursday, October 31, 2013. Maryland.
- (33) Presentation: “Industrial Design: Process for Innovation, User Center Development, Blending Research, Scholarship and Community”, Eastman Chemical Executive visit and lab tour, March 20, 2014.
- (34) Presentation: “User Centered Design Research, Laboratory for Analytic Sciences”, November 25, 2014.
- (35) Presentation: “Research for Human Centered Design: Informing product, environment, and simulation development”, Health and Sustainability Panel: Cosco, Joines, and Hu, College of Design Scholarship Forum, April 09, 2014.
- (36) Campus Stakeholder, The Ergonomics Center of North Carolina (TECNC) 5-Year Review, May 6, 2015.
- (37) Presentation: “Leveraging Universal Design in Rehab Engineering”, Johns Hopkins University, Baltimore, MD, December 1, 2015.

#### Mentoring Activities

- (1) Mentored an area high school student on his Eagle Scout project designing a podium for Dwarfs.
- (2) Mentored senior industrial design student, Steven Valenziano, Universal Design Cookware Research + Development, Awarded NCSU Undergraduate Research Grant Fall, 2009.
- (3) Mentored Danielle Souder, Honors Program ID student, 2013-14.
- (4) Mentored Meredith Brooks, Honors Program ID student, 2014-15.

#### Technology Transfer: Patents Pending and Disclosures Filed

- (1) Joines, S, Stahl, J., and Morris, G., Apparatus and Method for Repositioning Abdominal Fatty Tissue, United States Patent Application Number: 20080210223, Kind Code: A1, September 4, 2008.
- (2) NCSU File 03-107. Passive Motion Monitor Arm/Stand – The passive motion monitor arm/stand is designed to reduce the static posture in the neck associated with the task of typing on a computer. Accepted by the Intellectual Property Committee 5/1/2003.
- (3) NCSU File 03-108. An orthodic device to correct pectus excavatum (PE) – The orthodic device to correct PE is designed to slowly reshape the deformed chest wall with minimal surgical efforts. Inactive, unprotected.
- (4) NCSU File 07-052. Breast support device for sonographers performing echo scans on obese patients. Marketing queue.
- (5) NCSU File 07-045. Ergonomic ultrasound probe cover. Inactive, unprotected.

- (6) NCSU File 07-053. Pannus support device for sonographers performing general abdominal and fetal diagnostic scans on obese patients. Marketing queue.
- (7) NCSU File 08-058. Ultrasound probe ring. Inactive, unprotected.
- (8) NCSU File 09-062. Infinity Restaurant Tray Re-Design. Inactive, unprotected.
- (9) NCSU File 09-092. User Experience for acquiring digital content via mobile consumer electronic device using wi-fi/GPS accessing local database. Inactive, unprotected.
- (10) NCSU File 10-071. Universal Design Stovetop Cookware (Pot) Featuring Locking Safety Lid, Pouring Lip, Multiple Hand Position Secondary Handle, and Optional Stay-Cool Sleeve. Evaluating.
- (11) NCSU File 13-023. X-Ray receptor edge. Marketing Queue.
- (12) NCSU File 13-013. Breast Support and Cover for use during Cardiac Ultrasound Exams. Evaluating.
- (13) NCSU File 13-022. Ultrasound Probe Cuff: Cushioned ring and gel blocking hand cover. Marketing Queue.
- (14) NCSU File 14-031: Comfort Vest: Reinforced Vest for Aircraft Wing Mechanics and other Enclosed Area Access.
- (15) NCSU File 14-104. Thermoelectric Refugee Lighting, Option Agreement in Effect, 1/6/2014
- (16) NCSU File 14-109. TEG COMMERCIAL KITCHEN APPLICATIONS, Option Agreement in Effect , 1/6/2014
- (17) NCSU File 14-111. Heated outdoor seating TEC, Option Agreement in Effect, 1/6/2014
- (18) NCSU File 14-031. Comfort Vest: Reinforced Vest for Aircraft Wing Mechanics and other Enclosed Area Access, Marketing Queue, 1/16/2014
- (19) NCSU File 14-112. Floating Recreational Platform Assembly with Thermoelectric Generator and Photovoltaic Cells, Option Agreement in Effect, 1/17/2014
- (20) NCSU File 14-121. Thermoelectric platform for generating energy, storing it and using it, Option Agreement in Effect, 2/16/2014
- (21) NCSU File 14-219. PCM Cool-Pak Refrigerated Drug Packaging, Evaluating, 5/8/2014
- (22) NCSU File 14-221. New Bra Adjuster Straps, Evaluating, 5/8/2014
- (23) NCSU File 14-223. Dynamic Noise Reduction Solution, Evaluating, 5/8/2014
- (24) NCSU File 14-226. Bra closure and strap adjusters, Authorization Started, 5/8/2014
- (25) NCSU File 14-227. Sound dampening module, Authorization Started, 5/8/2014
- (26) NCSU File 14-228. Eastman - Acetate tow material, Authorization Started, 5/8/2014
- (27) NCSU File 14-229. Development of novel intimate apparel closures and adjusters, Authorization Started, 5/8/2014
- (28) NCSU File 14-276 Strap Adjuster of the Bra, 5/8/2014

US and International patent(s) submitted (fees for both the international and US filings were paid for by Hanes).

- (1) NCSU File 14-221. New Bra Adjuster Straps, Evaluating, 4/29/2015
- (2) NCSU File 14-226. Bra closure and strap adjusters, Authorization Started, 4/29/2015
- (3) NCSU File 14-229. Development of novel intimate apparel closures and adjusters, Authorization Started, 4/29/2015
- (4) NCSU File 14-276 Strap Adjuster of the Bra, 4/29/2015