Laboratory focus

The primary aim of the Neuroscience and Research Laboratory is to develop and apply techniques to improve rehabilitation of patients with unilateral hand impairment. Dr. Philip approaches this research through the lens of motor lateralization (handedness) as patients face distinct challenges when their disability affects their dominant hand. This line of research bridges the gap between basic, translational and clinical research by applying new knowledge about brain mechanisms and physical function to rehabilitation quests such as hand usage, activity participation and quality of life.

The laboratory addresses the relationship between handedness and rehabilitation via a three-pronged approach: (1) understanding the neural mechanisms of handedness, especially of handedness retraining, wherein patients adapt to use the non-dominant hand after chronic impairment of the dominant hand after nerve damage, stroke or other motor disability; (2) identifying the relationship between laboratory measurements of hand function and post-impairment changes in hand usage quality of life; and, once the characteristics of hand function that matter to patients are identified, (3) applying neurophysiological knowledge to help patients use dominant-hand mechanisms to improve function of the non-dominant hand.

Other current topics of investigation include how resource deprivation affects leisure participation and job performance among astronauts on space simulation missions.

Questions explored in laboratory

1. How does non-dominant hand usage drive quality of life after dominant-hand impairment?
2. What characteristics of intact hand function drive changes in usage, after impairment of one hand?
3. What physical and neurophysiological interventions will promote rehabilitation-relevant characteristics of non-dominant hand function?
4. What neural mechanisms support skilled performance with the non-dominant hand?
5. How does resource deprivation affect job performance during long-duration missions in isolated and controlled environments?

Contributions to rehabilitation science

Dr. Philip’s research program is aimed toward developing effective rehabilitation strategies for patients with impairments to their dominant hands. Studies will identify movement characteristics that affect hand usage and participation, identify underlying neurophysiological mechanisms, and use those mechanisms to develop interventions to facilitate learning of rehabilitation-relevant behaviors and skill.

Current and recent funding

Title: Compensation, and quality of life in peripheral nerve patients
Principal Investigator: Benjamin Philip, PhD
Funding Source: WUSM, The Program in Occupational Therapy, Young Investigator Pilot Award
Project Period: 3/01/17-6/30/19
Total Award: $130,689

Representative publications


Philip BA, Gokin AP, Strichartz GR. (under review). General anesthesia enhances the neural uptake of percutaneously delivered local anesthetic: an experimental study in rat sciatic nerve. Regional Anesthesia and Pain Medicine.


Philip BA, Rao NG, Donoghue JP. (2013). Simultaneous decoding of continuous hand movements from primary motor and posterior parietal cortex. Experimental Brain Research, 225(3), 361-75. PMID 23274645


