PM&R'S UNIQUE POSITION FOR INTERDISCIPLINARY RESEARCH

-ONE ACADEMIC INSTITUTE'S APPROACH-

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DISCLOSURES

- No financial relationships to report.

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"THE PROBLEMS CHALLENGING US TODAY, THE ONES REALLY WORTH WORKING ON, ARE COMPLEX, REQUIRE SOPHISTICATED EQUIPMENT, AND INTELLECTUAL TOOLS THAT JUST DON'T YIELD TO A NARROW APPROACH."

THEODORE BROWN - FOUNDING DIRECTOR EMERITUS OF THE BECKMAN INSTITUTE AS QUOTED IN "TEAM SCIENCE," NATURE, VOLUME 525, 17 SEPTEMBER 2015

"THE PROBLEMS IN THE WORLD ARE NOT WITHIN-DISCIPLINE PROBLEMS. WE HAVE TO BRING PEOPLE WITH DIFFERENT KINDS OF SKILLS AND EXPERTISE TOGETHER. NO ONE HAS EVERYTHING THAT'S NEEDED TO DEAL WITH THE ISSUES THAT WE'RE FACING."

SHARON DERRY - AN EDUCATIONAL PSYCHOLOGIST AT THE UNIVERSITY OF NORTH CAROLINA - CHAPEL HILL WHO STUDIES INTERDISCIPLINARITY AS QUOTED IN "TEAM SCIENCE," NATURE, VOLUME 525, 17 SEPTEMBER 2015

"PEOPLE FOCUS ON BIG PROBLEMS AND IF YOU GO FOR A BIG PROBLEM YOU NEED TO BE INTERDISCIPLINARY."

THEODORE BROWN - FOUNDING DIRECTOR EMERITUS OF THE BECKMAN INSTITUTE AS QUOTED IN "TEAM SCIENCE," NATURE, VOLUME 525, 17 SEPTEMBER 2015

THE NEED FOR INTERDISCIPLINARITY

Many health problems we face today are multifactorial and often require ***social and political*** input with interventions from ***medical and technological*** experts.

For example, the treatment of Chronic Pain can involve:

Engineering/Technology- Electrophysiology, Mechanical Engineering, Imaging Technology

Social- Case Managers, Social Workers, Population Health, Public Health, Sociology

Economics- Employers, Disability Insurers, Product Consumers

Academia- Biology, Genetics, Chemistry, Physiology, Anatomy, Sports Science

Medicine- PM&R, Pain, Neurology, Psychiatry, Psychology, Physical Therapy, Occupational Therapy

Political- FDA, CDC, Congress, health advocacy

Recent article from *The New York Times* July 14, 2021, "Tapping Into the Brain to Help a Paralyzed Man Speak." Pam Belluck about a nonverbal patient who received brain implant that allowed for machine learning to produce words on computer.

Based on this article, multiple disciplines were involved in this project:

Engineering/Technology- Electrophysiology, Mechanical Engineering

Academia- Neuroscience, Anatomy

Medicine- Neurosurgery, Speech Therapy, Orthotics & Prosthetics

Dr. Eddie Chang, a neurosurgeon at the University of California, San Francisco Medical School helped Pancho, a man paralyzed since age 20, speak through an implant in his brain that connects to a computer program. Mike Kai Chen for The New York Times

Original study found in NEJM:

Moses DA, Metzger SL, Liu JR, et al. Neuroprosthesis for decoding speech in a paralyzed person with anarthria. N Engl J Med 2021;385:217-227.

FOR ***NEW SOLUTIONS*** TO EMERGE THERE NEEDS TO BE AN EFFORT TO MOVE FROM ***MULTIDISCIPLINARY*** TO ***INTERDISCIPLINARY***.

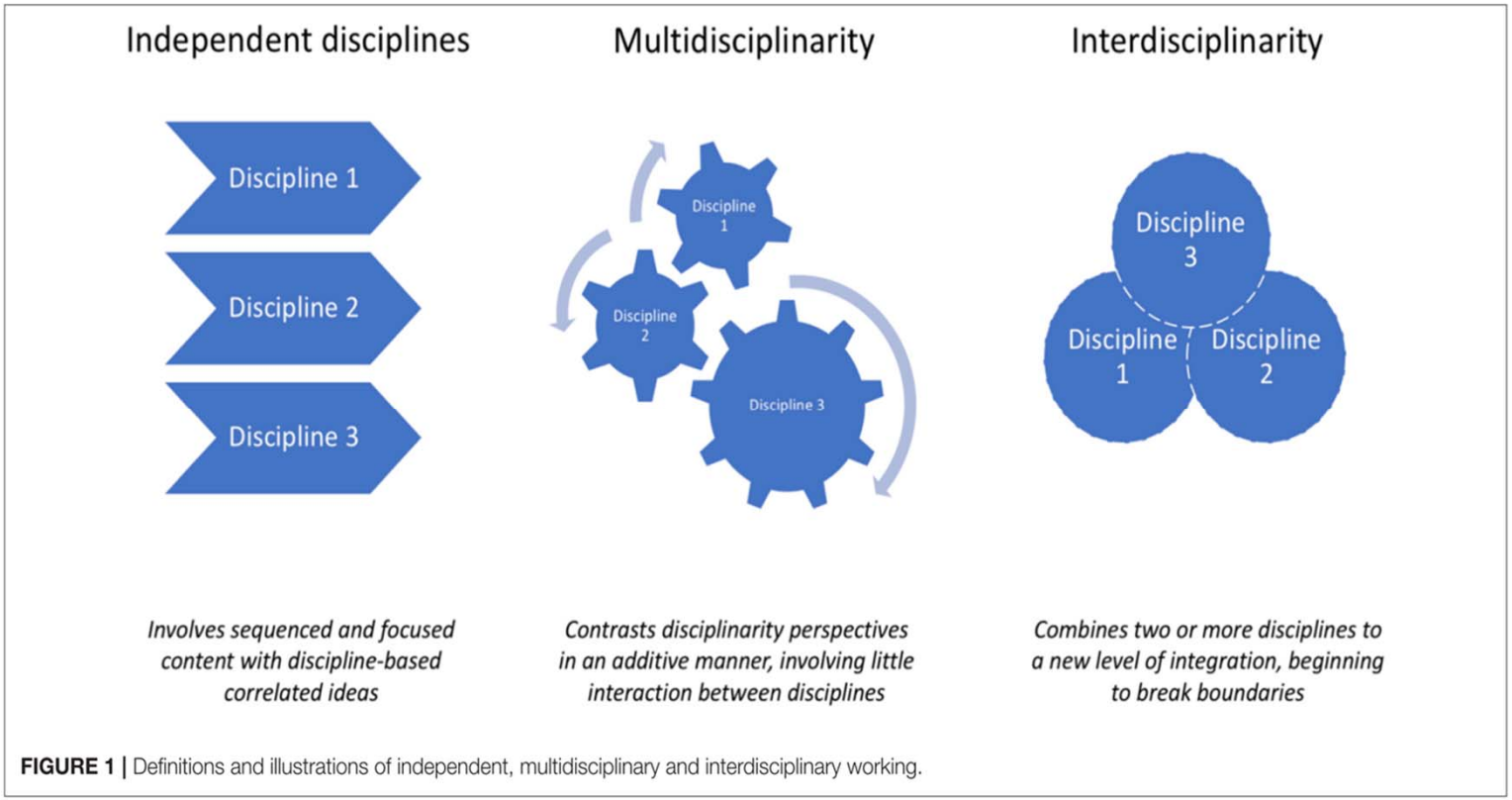

FIGURE 1 | Definitions and illustrations of independent, multidisciplinary and interdisciplinary working.

Marvel Studios, The Avengers, 2012

WHAT IS INTERDISCIPLINARY RESEARCH?

According to the ***National Academies of Science, Engineering and Medicine's*** report entitled, **Facilitating Interdisciplinary Research** (2005), interdisciplinary research is defined as:

> a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of clinical practice.

INTERNATIONAL CLASSIFICATION OF FUNCTIONING AND DISABILITY AND HEALTH BY THE WHO

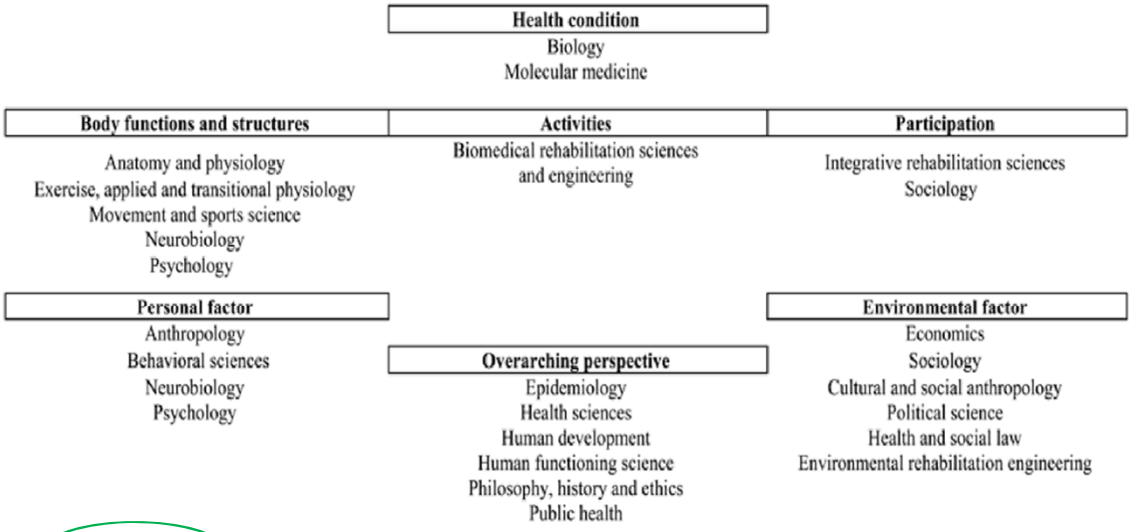

Fig. 2. Selected scientific disciplines related to human functioning and rehabilitation sciences. A scientific field may be relevant, focus or integrate more than 1 International Classification of Functioning, Disability and Health (ICF) component. For practical reasons it is only listed under 1 component.

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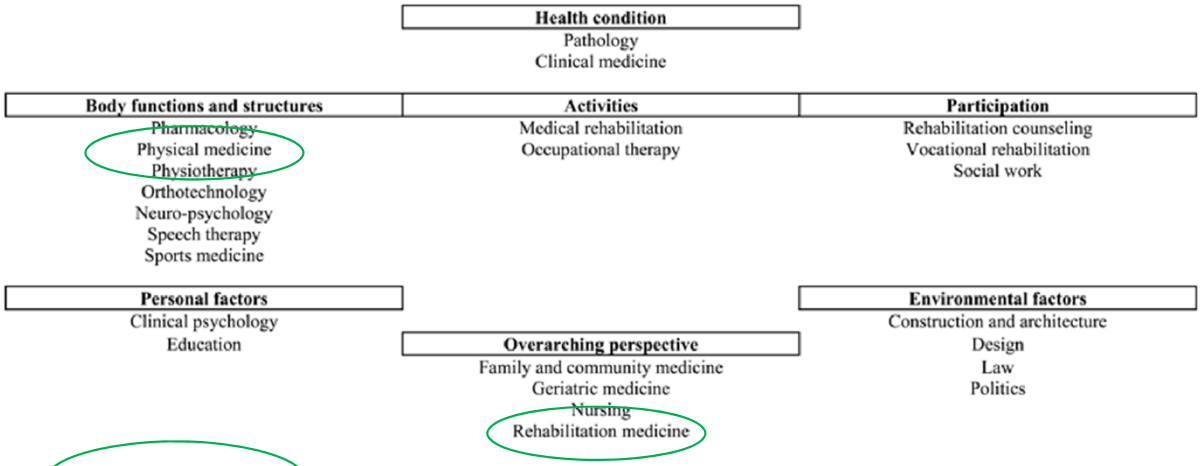


Fig. 3. Selected professional disciplines related to human functioning and rehabilitation sciences according to the unifying conceptual model ICF. A professional discipline may be relevant, focus or integrate more than 1 International Classification of Functioning, Disability and Health (ICF) component. For practical reasons it is only listed under 1 component.

"REHABILITATION RESEARCH THAT PROMOTES HEALTH, INDEPENDENCE, PRODUCTIVITY AND QUALITY OF LIFE CONDITIONS ***IS HIGHLY VALUED...*** REHABILITATION MEDICINE IS WELL KNOWN FOR ITS USE OF INTERDISCIPLINARY TEAMS IN THE CLINICAL SETTING, BUT IT ***HAS NOT DONE A VERY GOOD JOB WITH*** RESPECT TO ***INTERDISCIPLINARY RESEARCH***."

DELISA, *SHAPING THE FUTURE OF MEDICAL REHABILITATION RESEARCH: USING THE INTERDISCIPLINARY RESEARCH MODEL*. ARCH PHYS MED REHABIL VOL 85, APRIL 2004

PM&R IS UNIQUELY POSITIONED FOR INTERDISCIPLINARY RESEARCH

- PM&R focuses on the whole patient: physical, mental, social, spiritual
- Goal is to improve function and work towards returning people back to their place in society
- Working with different disciplines (OT, PT, SLP, SW) and specialties (Orthopedics, Neurosurgery, Neurology, etc.) is part of what we do clinically.
- Rehab provides intersection of multiple treatments, outcomes, and technology

OPPORTUNITIES FOR MEDICAL REHABILITATION RESEARCH

- Impact of diseases on MSK and NM system, CV and CP systems
- Function-oriented: patient adjustment to disability, integration into community, resumption of productive lifestyle, and QOL
- Improving physical capabilities with O&P, assistive technology, and effects on function
- Physical modalities of heat, cold, electricity
- Psychological responses to dysfunction and techniques for adjustment and management for patients and families
- Vocational interventions and environmental modifications

List adapted from DeLisa, *Shaping the Future of Medical Rehabilitation Research: Using the Interdisciplinary Research Model.* Arch Phys Med Rehabil Vol 85, April 2004

BENEFITS OF INTERDISCIPLINARY RESEARCH

- Individual growth from generation of new knowledge
- Exposure and creation of new methods, theories and ways of thinking
- Opportunity for larger impact
  - Successful solutions to complex problems can be achieved when a team is comprised of individuals with complementary interests, ideas, and/or professional goals
- Answering research questions nested in complex structures
  - Interdisciplinary science can help answer questions requiring integrated, multipronged approaches (e.g. chronic pain.)

BARRIERS TO INTERDISCIPLINARY RESEARCH

- Departmental or institutional logistics
  - Funding allocation
  - Academic promotion system (e.g. independent investigator model)
- Differing disciplinary approaches to research
- Difficulty in communication as different disciplines speak different "languages"
- Need to allocate more time to facilitate the research process
- Need for better interpersonal dynamics
- Need to clarify leadership roles

SUGGESTED FRAMEWORK FOR SUCCESSFUL INTERDISCIPLINARY PROJECTS

- Network of research sites, each of which have the following:
  - Administrative Expertise
  - Statistical Expertise
  - Information Systems Technology
- Pair a physiatrist and a PhD to develop and carry out research projects
- Encourage research with other departments and other academic institutions
- Hiring broad-thinking researchers and pairing them with practical technologists (engineers, computer scientists, etc.)

DeLisa, *Shaping the Future of Medical Rehabilitation Research: Using the Interdisciplinary Research Model.* Arch Phys Med Rehabil Vol 85, April 2004

FUNDING FOR REHABILITATION RESEARCH

- National Center for Medical Rehabilitation Research (NCMRR)
- National Institute on Disability Research and Rehabilitation (NIDRR)
- National Institute on Disability, Independent Living, and Rehabilitation Research
- Department of Veterans Affairs (VA)
- Department of Defense (DoD)
- Agency for Health Care Research and Quality
- Centers for Disease Control and Prevention (CDC)
- University or department endowments

APPROACH BY ONE ACADEMIC INSTITUTION TO DEVELOP INFRASTRUCTURE FOR IDR

Loma Linda University Chief Resident QI Project for 2020-2021

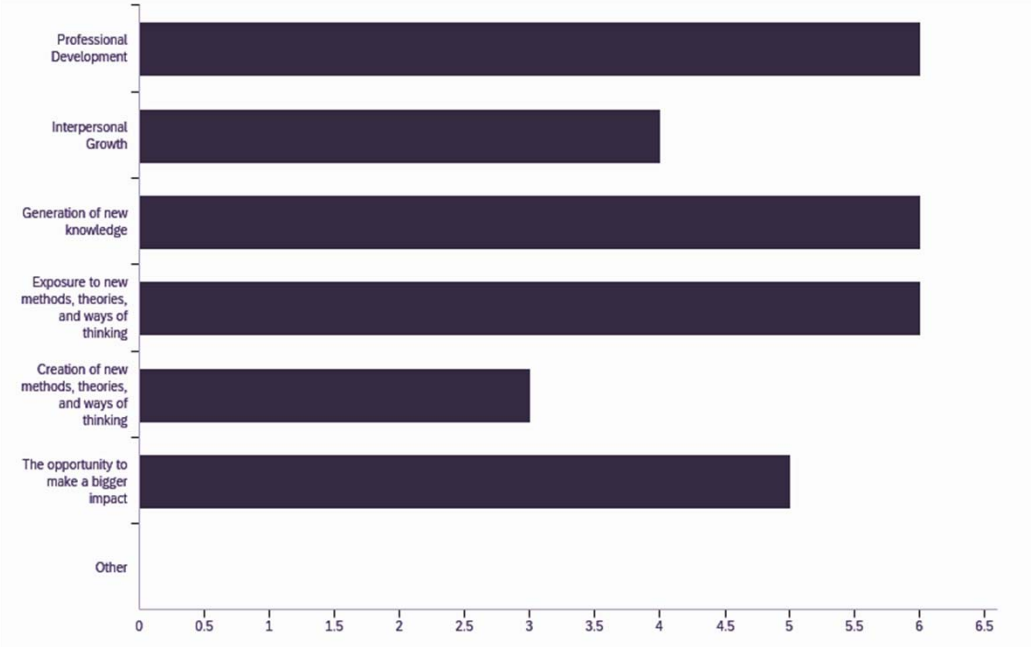
- Led by chief resident Zac Carter MD, project mentor Samuel Lee MD
- Multi question survey sent to explore interdisciplinary research (IDR) being conducted
  - Sent to AAP residency program director listserv
  - Sent to all LLU medical residency program directors
  - Sent to all non-medical LLU departments
- Data collection
- Connections established
- Ideas discussed
- Future plans

SURVEY RESULTS FROM PM&R RESIDENCY PROGRAM DIRECTORS

- Email to RPD's across the country via listserv
- N= 97 surveys sent
- N= 14 surveys returned (14% response rate)
- Participating in IDR = 64%

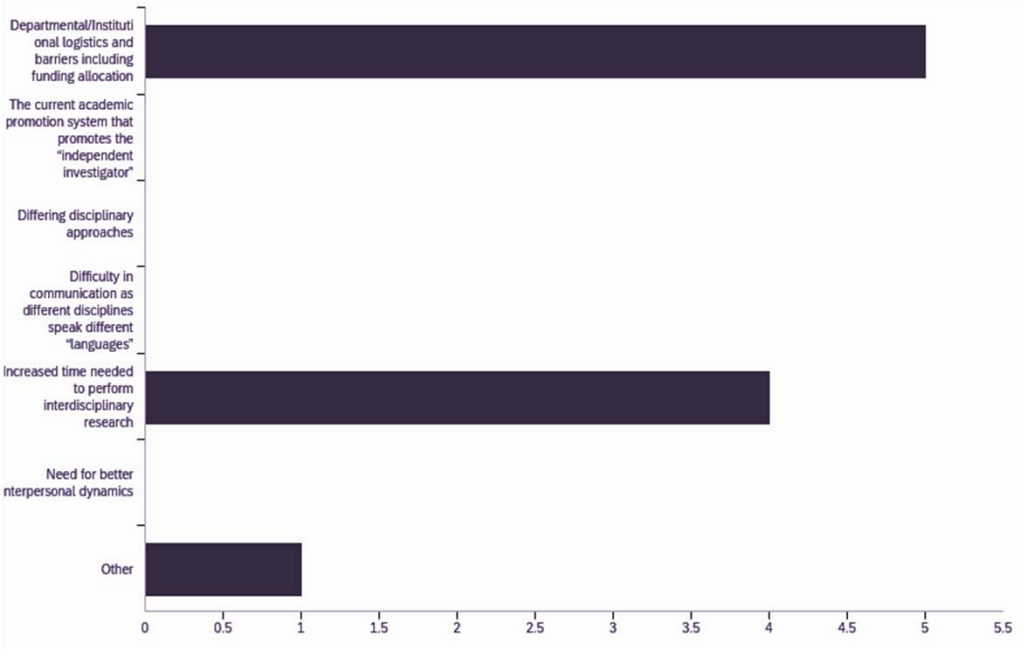
QUESTION ASKED

YQ1 - Which benefits do you feel promoted/encouraged your department to pursue interdisciplinary research? (Please select all that apply)



QUESTION ASKED

YQ2 - Which of the following barriers did you have to overcome in order to participate in interdisciplinary research?(Please select all that apply)

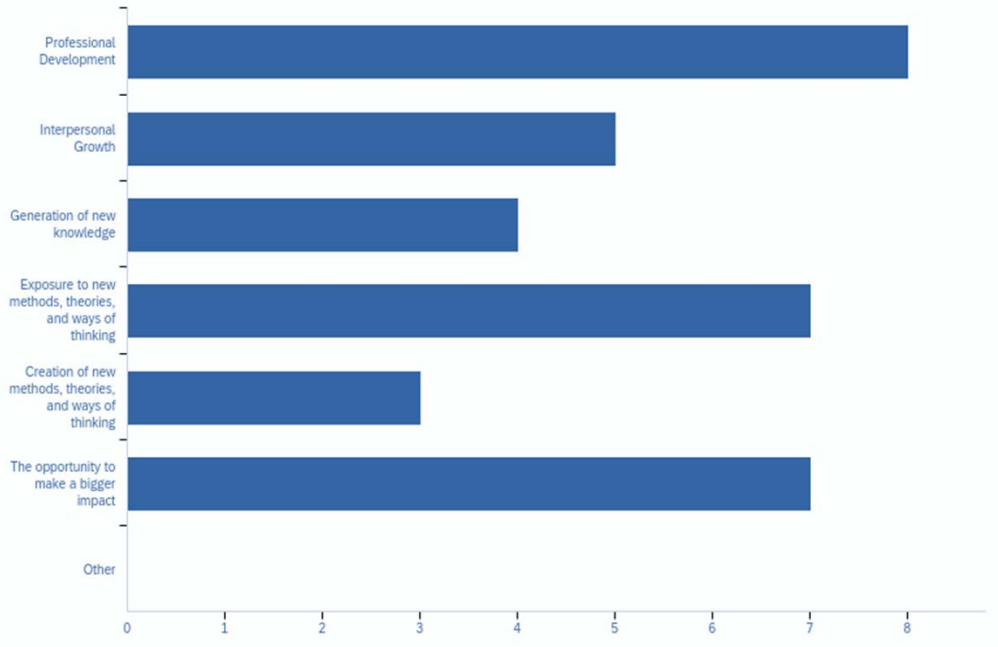


SURVEY RESULTS FROM LLU RESIDENCY PROGRAM DIRECTORS

- N= 49 surveys sent
- N= 12 surveys returned (25% response rate)
- Participating in IDR = 83%
- Interested in IDR with PM&R = 73%

QUESTION ASKED

YQ1 - Which benefits do you feel promoted/encouraged your department to pursue interdisciplinary research? (Please select all that apply)



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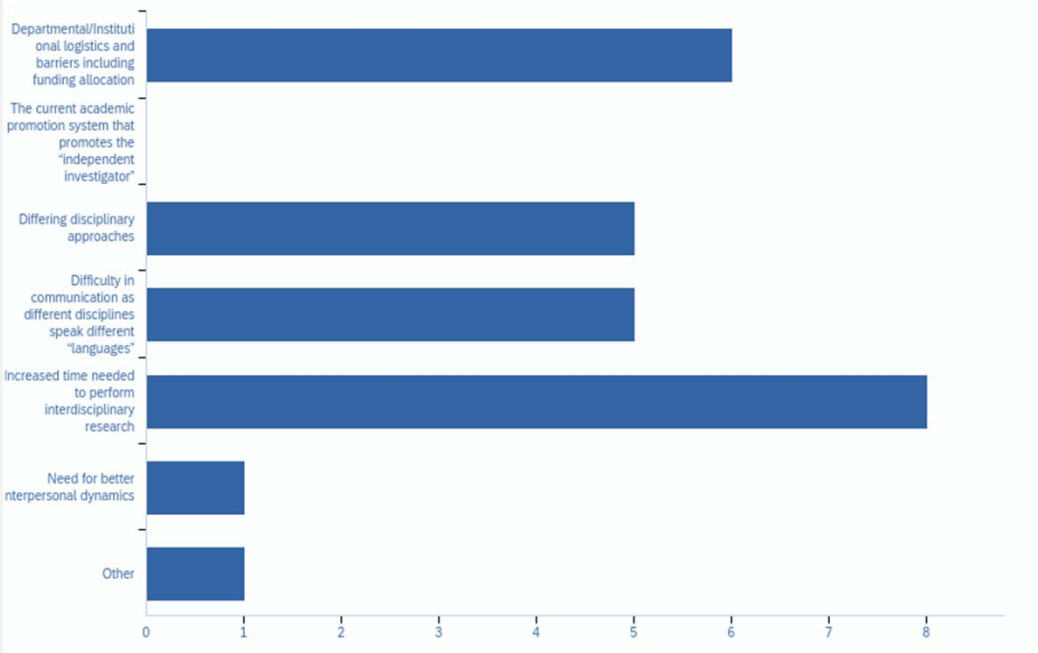
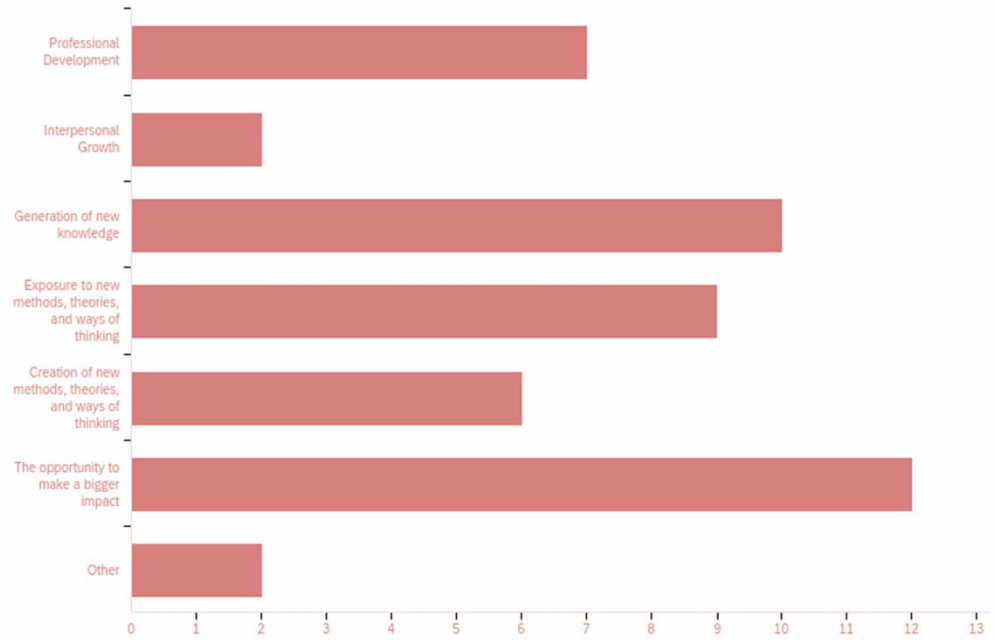


SURVEY RESULTS FROM LLU NON-MEDICAL PROGRAMS

- N= 52 surveys sent
- N= 20 surveys returned (38% response rate)
- Participating in IDR = 80%
- Interested in IDR with PM&R = 65%

QUESTION ASKED

YQ1 - Which benefits do you feel promoted/encouraged your department to pursue interdisciplinary research? (Please select all that apply)



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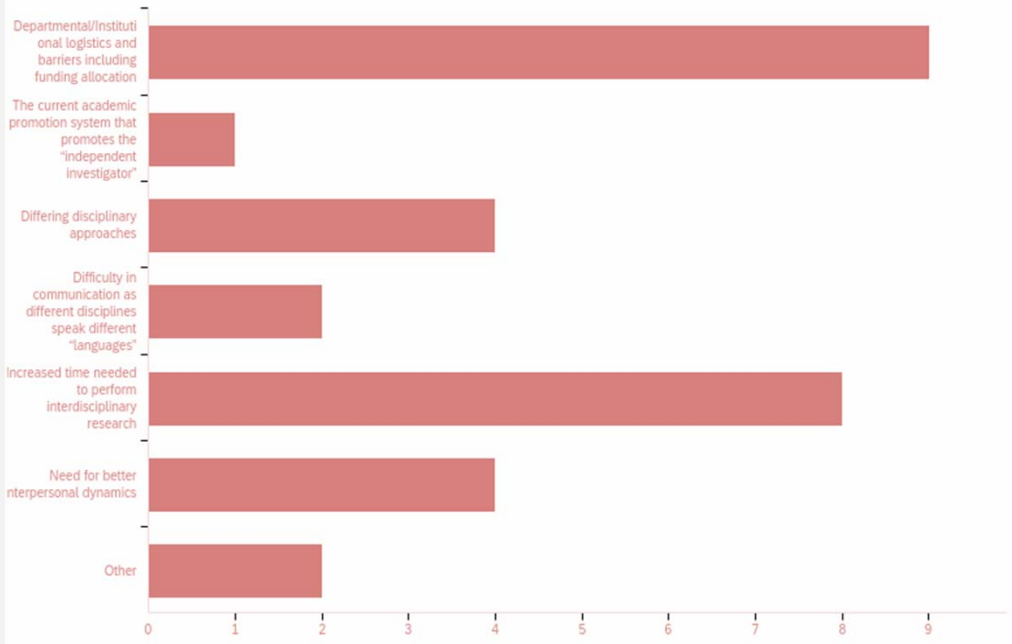

INTERESTING OUTCOME

We were contacted by the Center for Interprofessional Education
and Practice (CIPEP) at Loma Linda University

- Forwarded our survey
- LLU has a center that is dedicated to interdisciplinary education, research, and service within the institution
- Connected with and presented to CIPEP the unique position PM&R has for IDR, and laid plans for further relationship-building

CONNECTIONS & NEXT STEPS

- Connected with Geoinformatics department of LLU
  - Discussed framework for future collaboration on research projects
- Presented findings to PM&R residency and department research director, brainstormed ideas for funding opportunities within institution (Shark Tank-style competition), and encouraged big ideas that think beyond normal avenues of research

CHALLENGES

- Funding
- Time for IDR research
- Educating and shifting mindset and approach towards research to be wider
- Department and institutional-level cultural shift
- Identifying, recruiting, and retaining researchers--both clinical and basic science

SOURCES

- *Team Science,* Nature, Volume 525, 17 September 2015
- DeLisa, *Shaping the Future of Medical Rehabilitation Research: Using the Interdisciplinary Research Model.* Arch Phys Med Rehabil Vol 85, April 2004
- *National Academies of Science, Engineering and Medicine's* report entitled, *Facilitating Interdisciplinary Research* (2005)
- *The New York Times*

THANK YOU