TRAINING IN REHABILITATION RESEARCH

John Whyte MD PhD

Moss Rehabilitation Research Institute

&

Thomas Jefferson University

W Zev Rymer MD PhD

Rehabilitation Institute of Chicago

&

Northwestern University

CONCEPTUAL BACKGROUND

- What is rehabilitation research?
- Why is conducting rehabilitation research particularly challenging?
- What are the implications for rehabilitation research training?

Rehabilitation Research

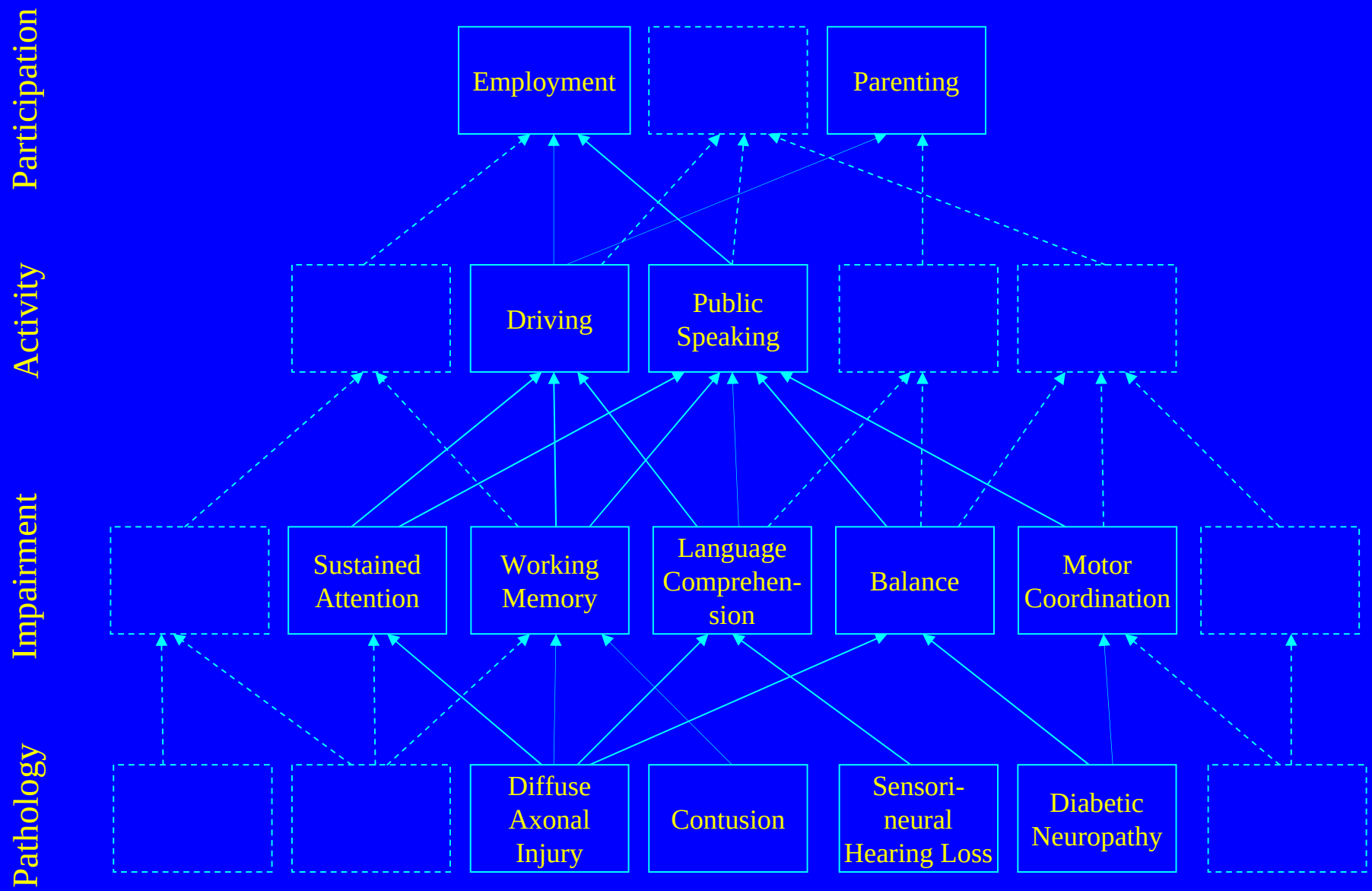
- Addresses diseases and conditions that are not currently curable or, if curable, leave residual disability
- Addresses in the short or medium term, the functional abilities and quality of life of the individuals affected
- Involves complex relationships among several levels of conceptual analysis

The Enablement/Disablement Process

- Pathology/disease
- Impairment
- Disability/functional limitation/activity
- Handicap/disability/participation

Biomedical Research

- Deals primarily with pathology and somewhat with impairment
- Assumes that function is directly related to resolution of pathology
- What about…..
  - Improvement in function w/o improvement in pathology?
  - Improvement in pathology w/o improvement in function?


Participation
Activity
Impairment
Pathology
Employment
Parenting
Driving
Public Speaking
Sustained Attention
Working Memory
Language Comprehen-sion
Balance
Motor Coordination
Diffuse Axonal Injury
Contusion
Sensori-neural Hearing Loss
Diabetic Neuropathy

Levels of Intervention

		LEVEL OF OUTCOME			
		Pathology	Impairment	Activity	Participation
LEVEL OF TREATMENT	Pathology				
	Impairment				
	Activity				
	Participation				

Building Blocks

- Research subjects -- case mix issues: different case mix models for different outcomes
- Treatment: active ingredients, protocols, blinding
- Dependent variables: relevant validated outcome measures are lacking in many areas

Implications for Research

- Ideally, research should clarify the causal links among levels in the enablement/disablement process
- Most NIH-funded rehabilitation research to date stays primarily at one level

Implications for Training

- Investigators will often need to work in interdisciplinary teams
- Having in-depth knowledge regarding a level above or below the “target” level can be ideal
- Researchers need to build quantitative and testable models of these interrelationships
- Who mentors the linkages?

There are advantages in not being too original at the start

- You must realistically think about rapid productivity
- If you work on a close off-shoot of a mentor's research s/he will be able to help you anticipate and solve methodological problems
- If you work on a more distant problem, your mentor will be able to offer guidance but less direct experience

Write a Career Development Plan

- Who are you now and what skills do you possess?
- Who do you want to be and what skills will you need?
- What types of training experiences (courses, laboratory skill exposure, etc.) will get you there?
- Is your proposed mentorship plan the ideal path? What additional mentorship do you need?

Negotiating a Faculty Position that Includes Clinical Research

- Having funding in hand provides leverage
- Need to make sure that you are in an environment that nurtures further research growth
- Long-term development is more important than short-term benefits: you can write your own ticket at your next job if you succeed!

What to look for in a Clinical Faculty Position

- Realistic amount of protected time (paid by your grant or as an investment by the department)
- Availability of relevant collaborators and technology
- Suitable patient population
- Continued mentorship and support for career development

Research Careers for Biomedical Scientists and Engineers

- If you are in a basic science or engineering department, and do rehabilitation research ---
  - A key issue is clinical relevance of your work and access to clinical materials
- If you are a Ph.D. in a clinical department ----
  - A key issue is whether you will be treated as an equal - a lot depends on how money flows

GRANTSMANSHIP

- Grant awards are a measure of your creativity and your competitive strength
- They also fund your research

  But the former is perhaps more important, because it tells your employer you can probably compete in the future (because you already have been successful)

Grant Writing Skills

- Think about a progression of funding, e.g.:
  - Training grant (T32, F32, F31 or other awards)
  - Co-investigator on an R01 or other major grant
  - Pilot grant (R03, R21,R15)
  - Career development award (K01, K08, K23, K25)
  - Large grant as PI (R01- can be several 100K/annum)
  - PI of larger collaborative grant (P01, P50---)

Mechanism/Theory

- The NIH is very mechanism-oriented - this focus is what got the NIH to be the premier research funding agency in the world
- Many of these mechanisms are quite fundamental - molecular-cellular, physical-chemical level
- Descriptive approaches are much less likely to succeed
- Develop hypotheses that are clearly linked to fundamental mechanisms, if possible

Scope of the Research

- Establish a broad rationale for your approach:
- Why is this research important to do in general, and why is it worth doing now?
- Are there new ideas, new techniques, new analyses available ?
- Make your aims manageable in size, but ambitious enough to be challenging --
- Let the reviewer understand the grand scheme, but be clear about the work you'll accomplish during the funding period

Specific Aims

- General Aims: provide broad rationale and motivation (in brief)
- Specific Aims: should be very precisely articulated, because they will dictate everything else you write
  - Corresponding hypotheses
  - Corresponding measurement and statistical models
  - The panel will want to know why you made your choices -
  - Let your aims drive the grant- background, preliminary data and methods

General Hints about Grant Preparation

- Avoid verbosity and clutter -an open looking grant is more readable
- Use figures and tables, rather than text
- Minimize appendices
- For a major grant gave preliminary data on all of your major aims if possible
- Have a draft read by a merciless colleague with NIH grant experience

Special Kinds of Grants for Engineers

- BRG:

  Bioengineering Research Grant

  Can be used for device development-may not need scientific hypotheses
- BRP -Bioengineering Research Program

  An industrial, multi-project collaborative program

The Review Process

- Look for and request optimal review panel
- Few applications are funded on the first round
- Allow enough time to do revision
- Read between the lines

  (and seek help from the program officers about the message the panel means to send)

Negotiating a Faculty Position that Includes Basic or Engineering Research

- Having funding in hand provides leverage
- Make sure that you seek an environment that nurtures your growth.
- You need people around you who understand your work and to share ideas with - you cannot be effective as a solitary investigator.
- You need a good start-up package, funded students or fellows, and summer salary (if on nine-month appointment)

Some Specifics about Clinical Trials

- Rarely should a full-fledged clinical trial be proposed as a first step
- Develop a logical program of research that builds over time
- Longitudinal natural history data (clinical database) can provide information about prevalence, variations in outcome, treatments received, sensitive outcome measures

Clinical Trials (cont.)

- Treatment: Is it currently well-specified and are active ingredients known?
  - Consider observational studies of treatment
  - Development of treatment manual
  - Quality control studies of treatment
- Outcome measures: Are appropriate ones in existence?
  - One level or several
  - Reliability/validation studies

CONCLUSIONS

- Success in research requires a prolonged period of training with gradually increasing independence
- Much of success depends on funding, which is highly competitive
- So Why Do It?

BECAUSE

- It’s fascinating
- It’s fun
- It’s important to our field and to people with disabilities
- You can design your own career
- The “same” job is always different
- It’s prestigious
- WHAT MORE DO YOU WANT?