

Hand Dominance Re-training following polytrauma or limb loss



Katie Yancosek, OTR/L, CHT

Objective

Raise awareness of hand dominance and discuss treatment options for re-training/transfer.

**Ultimate Goal: IMPROVE FUNCTIONAL OUTCOMES
via RELEVANT CLINICAL CARE PATHWAYS**



"You have repetitive motion injury. Try using the TV remote with the other hand."

WHAT

What is hand dominance?

Hand dominance is the preferential use of one hand over the other for single limb or bi-manual tasks

In bi-manual tasks one hand is the **main** **executor** and one is the **supporter**.

Hand Dominance

- The dominant hand is affected (acute or chronic) more often than the non-dominant hand
- Traditional medical disability ratings consider hand dominance as a main factor

Hand Dominance

- Limb dominance is evident in most primates and in some lower animals (ex: frogs, rabbits)
- Why do we exhibit hand dominance? unknown and still debated
- Hand dominance may be a continuous variable rather than a dichotomous variable (left-ambidextrous-right vs. left or right)
 - Edinburgh Handedness Inventory=Laterality Quotient

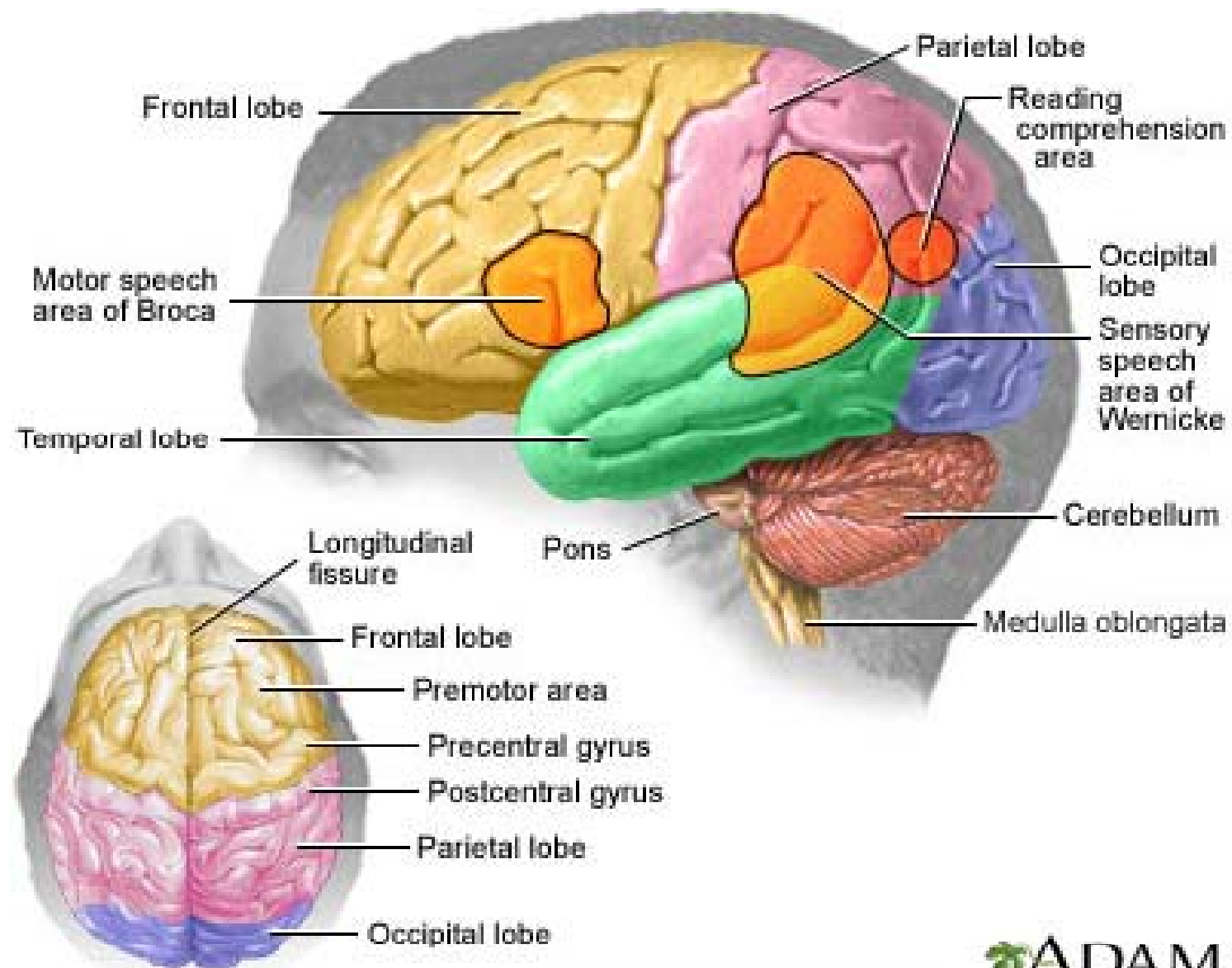
Hand Dominance

- 9/10 people are right handed
- Greater than 60% of the 10% of lefties are male
 - One theory relates to in-utero exposure to testosterone
- “***Dexterity***” comes from the root word dexterous which means right-sided

HAND DOMINANCE

Is the peripheral manifestation of cerebral dominance

Strongly LINKED TO LANGUAGE: gesturing, speech, and writing



 ADAM.

Hand dominance primarily defined by the writing hand

WHO

Who

should receive hand dominance
re-training?

WHO

**Brachial plexopathies, Hemiparesis following stroke,
Chronic Regional Pain Syndrome, Mutilating hand
Injuries: burns, crush injuries, multi-tissue injury,
Amputation**

WHY

Why

address hand dominance
re-training?

WHY...

Loss of dexterity in dominant hand
means many things.....

- A functional state of single-handedness
- Limited **dexterity**, strength, endurance, speed (awkward and slow movement)
- Loss of occupational/social roles
 - Hand shaking, embracing, self-expression: jewelry (bracelets, watches, wedding rings), nail painting
 - Work
 - Sports/leisure
 - ADL

Why retrain hand dominance?



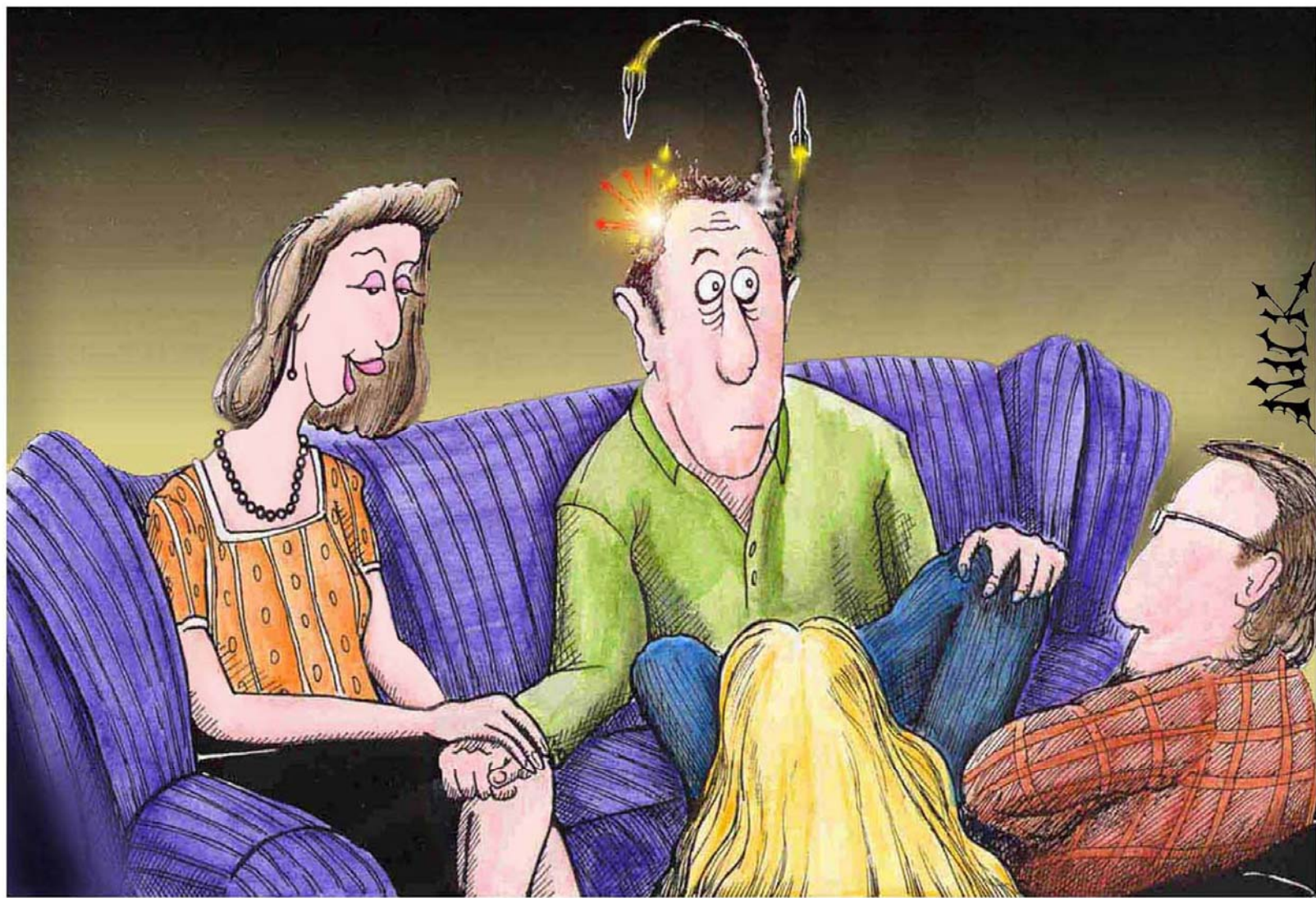
MIND THE GAP

**Current Functional
Status: Impaired**

**Goal: Functional
Independence and
participation**

WHY

Because hand dominance is the *pervasive* use of one hand over the other, and we need to be purposeful, not passive, in our approach!



“You’ll have to forgive Sidney. The left and right hemispheres of his brain are currently engaged in a struggle for dominance...”



WHY



Offer your clients POWER and CONTROL

HOW

HOW do we facilitate a hand
dominance transfer?

Can we *actually* facilitate HDT?

YES

- Hand dominance changes across time
- Lateralized practice
- Environmental influences
- Neuroplasticity: dynamic systems capable of CHANGE

NO

- CNS stability:
- Innate left-handers
- Obstetrical Erbs Palsy

One-handed ADL

See Backpack list under Resources Tab

- Adaptive equipment
- You-tube videos: hair-tying, shoe-tying, neck-tie tying, jewelry application

Handwriting For Heroes



**Kathleen E. Yancosek, MS, OTR/L, CHT
and Kristin Gulick, OTR/L, CHT**

Illustrated by Erin M. Spears

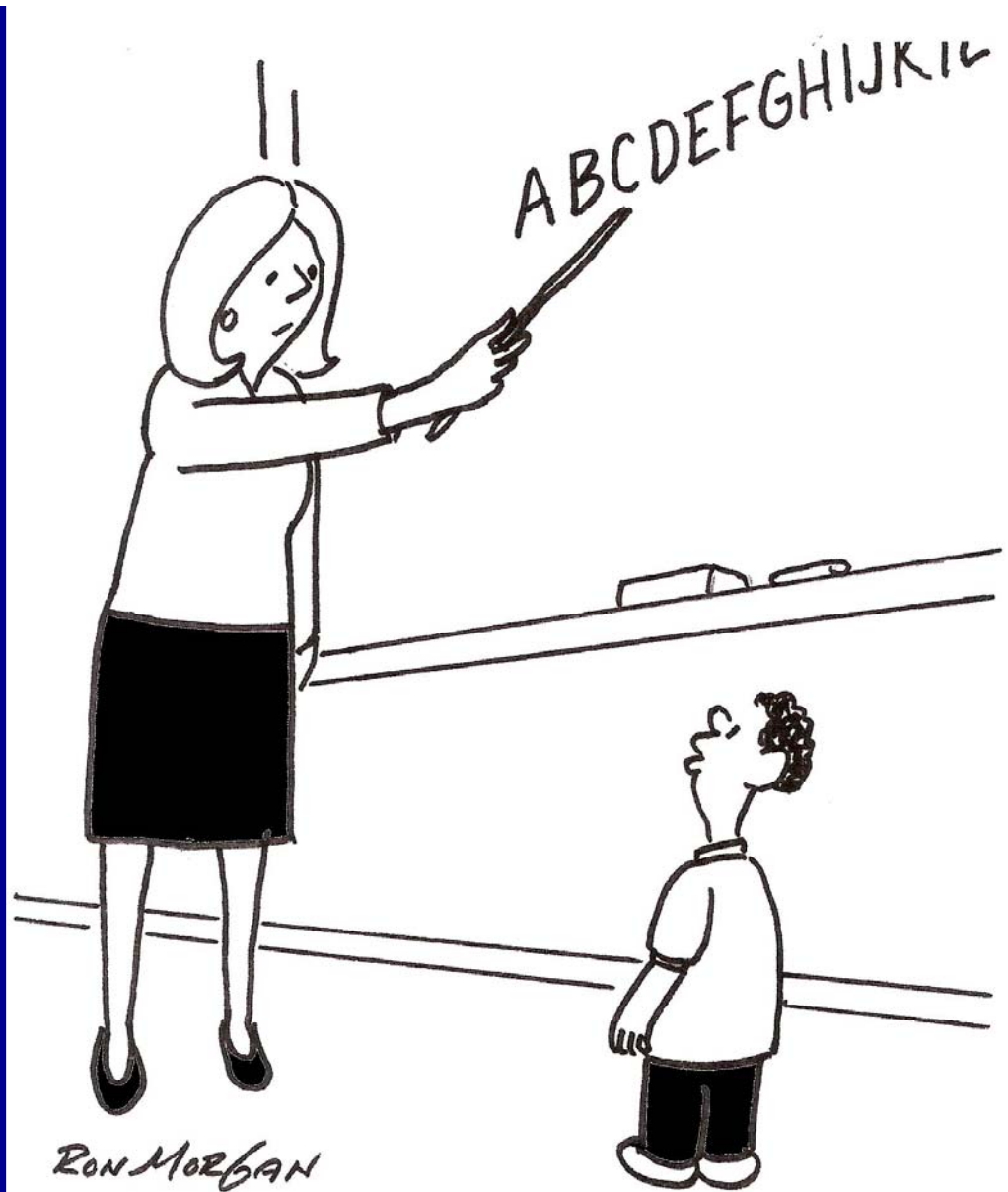
Two studies

- Efficacy trial (with non-impaired participants) made statistically significant improvements in dependent variables of legibility, letters-per-minute, velocity (x and y axes)
- Clinical effectiveness trial (with impaired military members) show similar results

Description of Intervention

- 42 day massed-practice, task-oriented approach with focus on handwriting activities that progress from simple to complex.
- Four main sections: 1. daily exercises/writing activities, 2. homework, 3. therapist's tips, and 4. web site companion

www.handwritingforheroes.com



“Do we have to know all the letters? I don’t use them all when I text.”



1st Study: Participants wrote 32 minutes per day

Clinical effectiveness study: COPM: writing in college (taking notes, taking tests), paying bills, filling out forms in the hospital, journaling, writing to-do lists, writing letters, signing one's name



REHAB

RE-*HABIT*

Language-based activities

- *Writing
- Drawing/Painting
- Texting/Typing

Power-based

- Hammering
- Washing mirrors
- Weight training





Precision Pouring



Integrate Prosthesis







Sports-based HDT



WHEN do you start? Consider:

- Co-morbidities and concomitant injuries
- Prior level of function (PLOF) and current occupational demands (B) and (I)ADL
- Patient's goals
- Time since loss of dominant hand function
- (in non-amputee population) PROGNOSIS of recovery of function
- Laterality

References

1. Ficke JR, Pollak AN. Extremity war injuries: Development of clinical treatment principles. *J Am Acad Orthop Surg.* 2007;15(10):590-595.
2. Connelly V, Dockrell JE, Barnett J. The Slow Handwriting of Undergraduate Students Constrains Overall Performance in Exam Essays. *Educational Psychology.* 2005;25(1):99.
3. Smits-Engelsman BCM, Niemeijer AS, van Galen GP. Fine motor deficiencies in children diagnosed as DCD based on poor grapho-motor ability. *Human Movement Science.* 2001;20(1-2):161-82.
4. Rosenblum S, Werner P. Assessing the handwriting process in healthy elderly persons using a computerized system. *Aging Clinical Experimental Research.* 2006;18(5):433-9.
5. Smeulders MJ, Kreulen M, Bos KE. Fine motor assessment in chronic wrist pain: the role of adapted motor control. *Clinical Rehabilitation.* 2001;15(2):133-41.
6. Mullineaux DR, Barnes, C.A., Batterham, A.M. Assessment of bias in comparing measurements: A reliability example. *Measurement in Physical Education and Exercises Science.* 1999;3(4):195-205.
7. Walker L, Henneberg M. Writing with the non-dominant hand: cross-handedness trainability in adult individuals. *Laterality.* 2007;12(2):121-30.
8. Fitts PM, Posner M.I. *Human Performance*: Brooks/Cole Publishing; 1967.
9. Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods.* 2007;39(2):175-91.
10. Summers JC, F. Assessment of handwriting speed and factors influencing written output of university students in examinations. *Australian Occupational Therapy Journal.* 2003;50:148-57.
11. Graham S, Harris KR. Improving the writing performance of young struggling writers: Theoretical and programmatic research from the center on accelerating student learning. *The Journal of Special Education.* 2005;39(1):19-33.
12. Deuster PA, O'Connor FG, Henry KA, Martindale VE, Talbot L, Jonas W, Friedl K. Human Performance Optimization: An evolving charge to the Department of Defense. *Military Medicine.* 2007;172(11):1133-1137.