

Novel use of fMRI in the rehabilitation of conversion disorder

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E. M. R. S. S.

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Rehabilitation Summer School**

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REHABILITATION

Yesterday – Today – Tomorrow

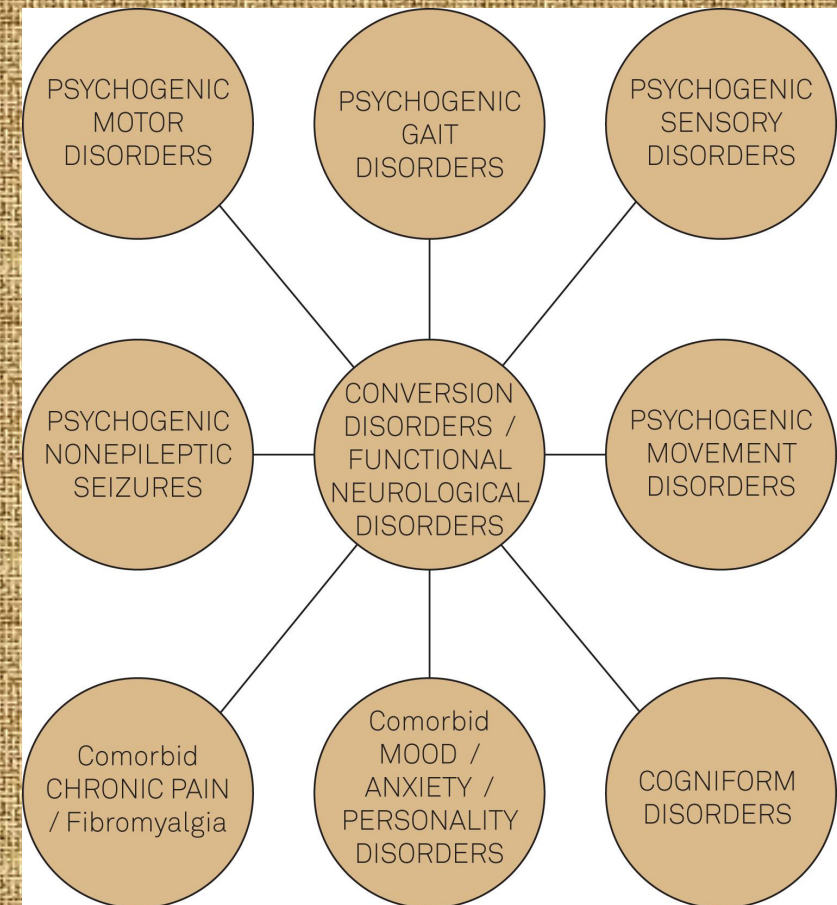
Syracuse 16 – 19 October 2025

Conversion disorder

- Conversion disorder is a subset of the somatoform disorders.
- It has one or more symptoms that affect voluntary motor or sensory function suggesting a neurological or other medical condition, but they are inconsistent with known neurological or musculoskeletal pathologies.
- Individuals with conversion disorder do not intentionally produce or feign their symptoms. Instead, the symptoms are due to an unconscious expression of a psychological conflict or need.
- The symptoms are often reinforced by social support from family and friends or by avoiding underlying emotional stress.

Physical Therapy Management for Conversion Disorder: Case Series

Ness, Debra MPT, DSc, PT, Journal of Neurologic Physical Therapy: March 2007 - Volume 31 - Issue 1 - p 30-39



PREVALENCE



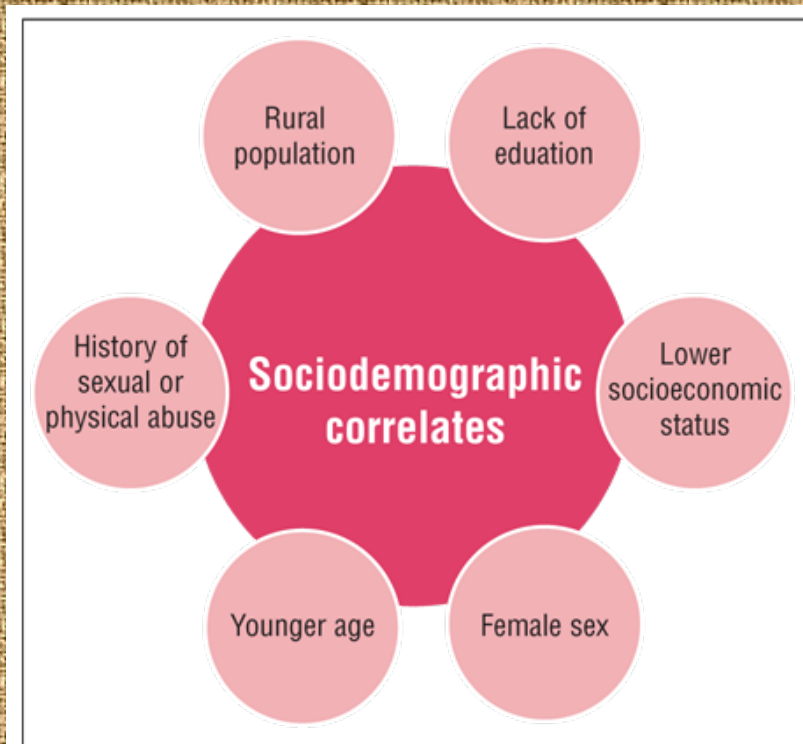
*~25% OF PSYCHIATRIC OUTPATIENTS ARE
DIAGNOSED WITH CONVERSION DISORDER*



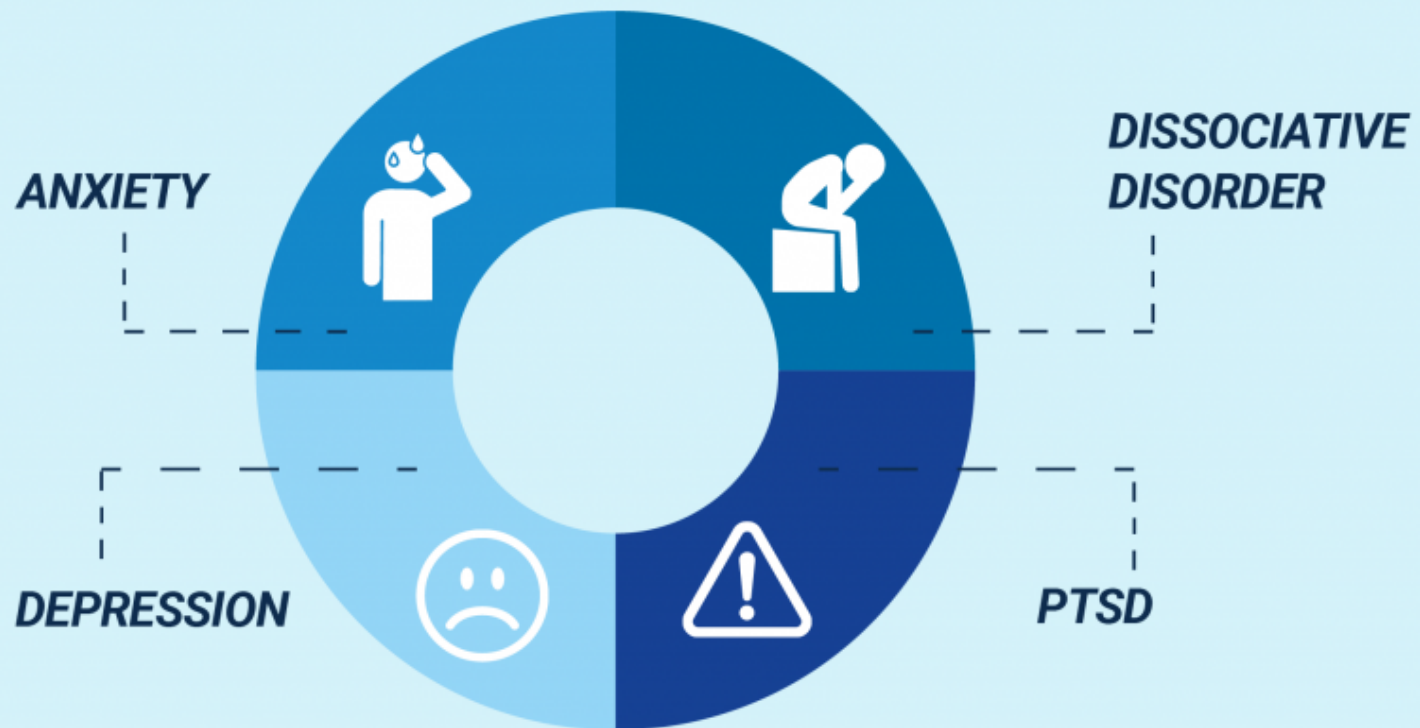
*CONVERSION DISORDERS ARE 200% MORE
COMMON IN WOMEN THAN MEN*



*CONVERSION DISORDERS ARE MORE COMMON
IN INDIVIDUALS WITH LESS EDUCATION AND
LOWER-SOCIOECONOMIC STATUS*



COMMON CO-OCCURRING DISORDERS



A complete medical assessment is essential in order to rule out any possibility of an organic etiology.

- In as many as 25% to 50% of patients diagnosed as conversion, an organic medical diagnosis was found.

Spinal Cord. 2002 Jul;40(7):327-34.

Conversion motor paralysis disorder: overview and rehabilitation model.

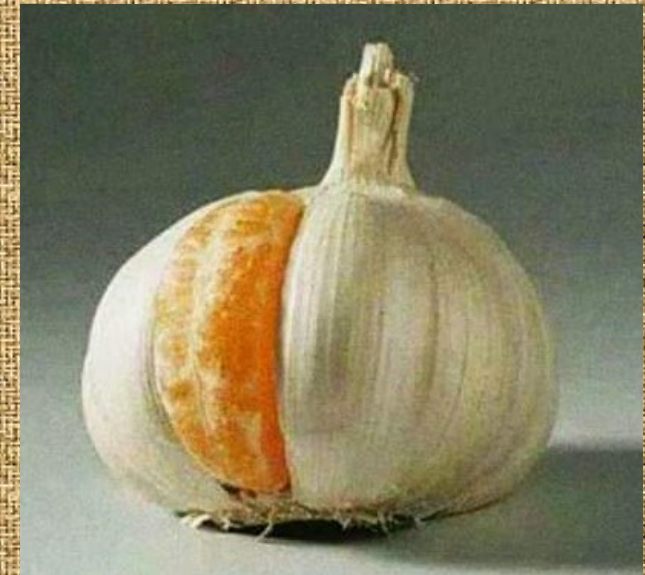
Heruti R, Levy A, Adunski A, Ohry A. Rehabilitation Ward, Reuth Medical Center, Tel-Aviv, Israel.

- Patients diagnosed with neurological disease sometimes have a functional diagnosis at follow-up which, with hindsight, better explains the original symptoms. This occurs at a frequency similar to the misdiagnosis of 'organic' neurological disease as functional disorder.

J Neurol. 2019 Aug;266(8):2018-2026.

The misdiagnosis of functional disorders as other neurological conditions.

Walzl D, Carson AJ, Stone J.

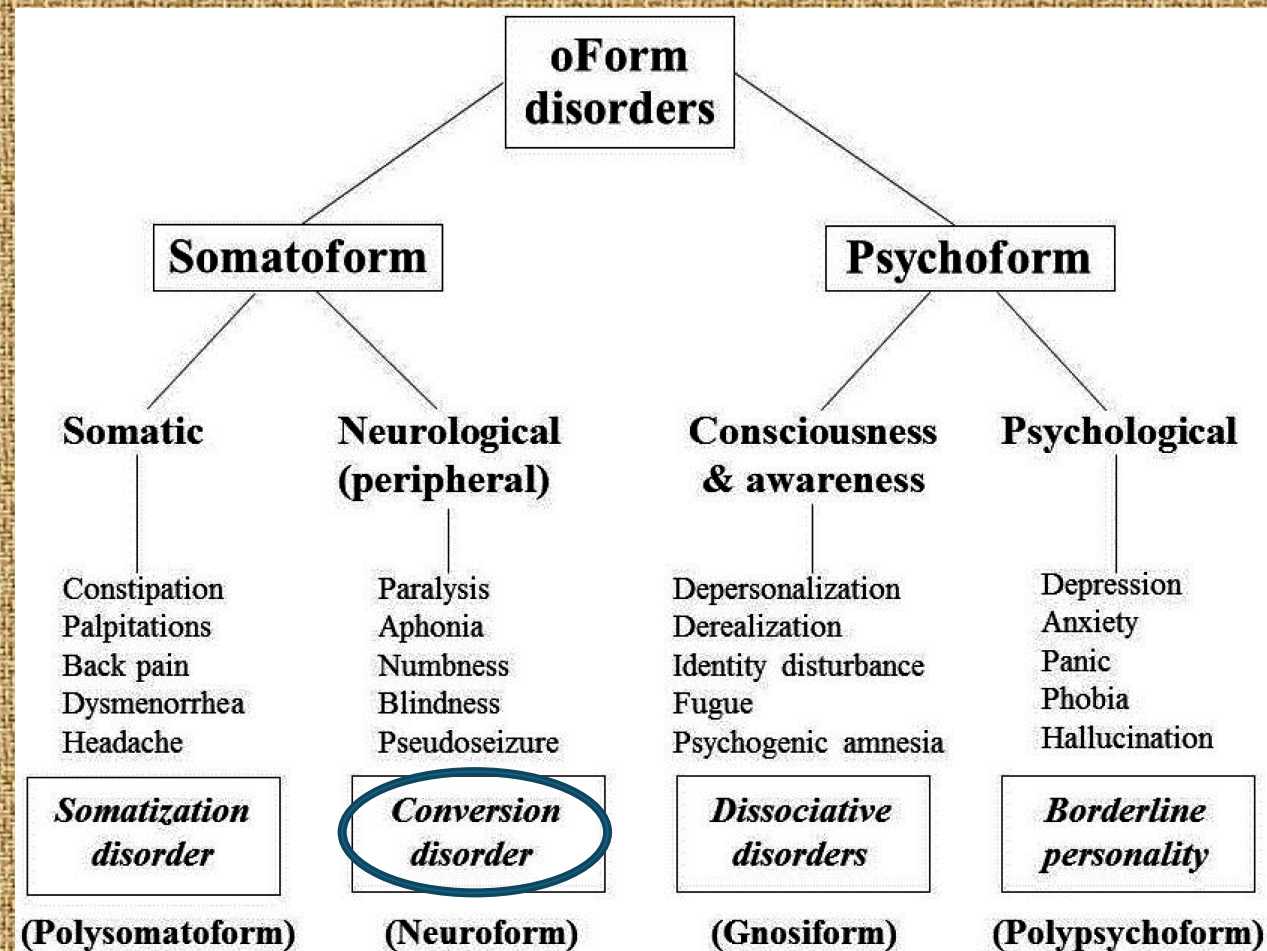


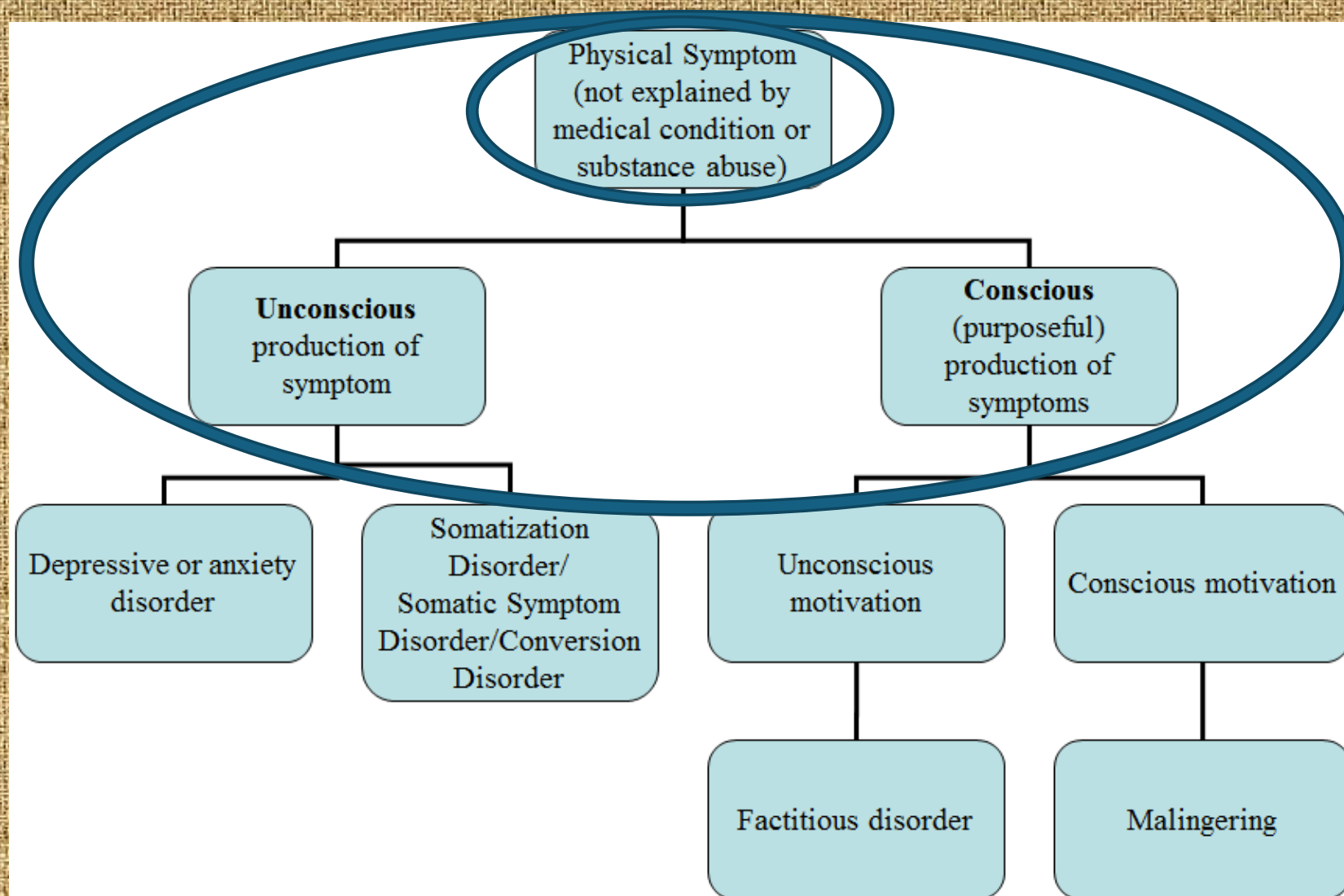
**If you look like you don't necessarily
mean that you fit**

Behav. Sci. **2015**, *5*(4), 496-517;

The Classification of Hysteria and Related Disorders: Historical and Phenomenological Considerations

Carol S. North





Disorders of Nonorganic Origin (MP). Diagnosis

1. *Lack of organic explanation of symptoms (MP)*
2. *Variability of symptoms and functional unpredictability*
3. *Disconnection between Impairment, Activity Limitation & Participation Restriction*



Basic aspects of Rehabilitation approach

- Rehabilitation program, based on ISF paradigm is an optimal framework
- Intensive use of functional task-oriented approach
- Step by step realistic goals' achievement program
- Intradisciplinary and multidisciplinary staff work
- A “non-confrontive” approach with clear behavioral boundaries in most cases...
- Use of multiple treatment techniques and technologies, double – tasking, gaming...



Task-oriented approach



High intensity of active rehabilitation in multiple sessions and self-training

“Passive” approach



Relaxation & rest

Physical Medicine



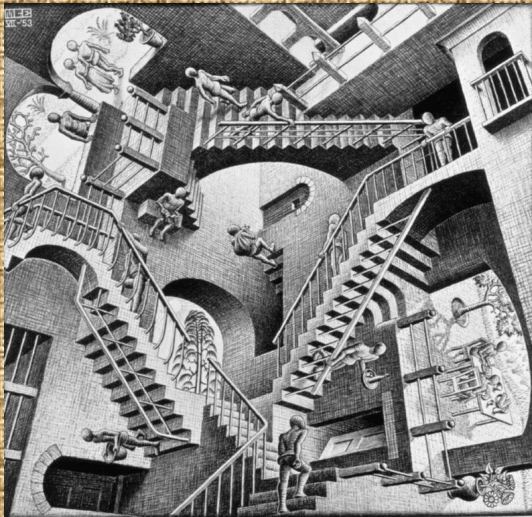
“Active” approach



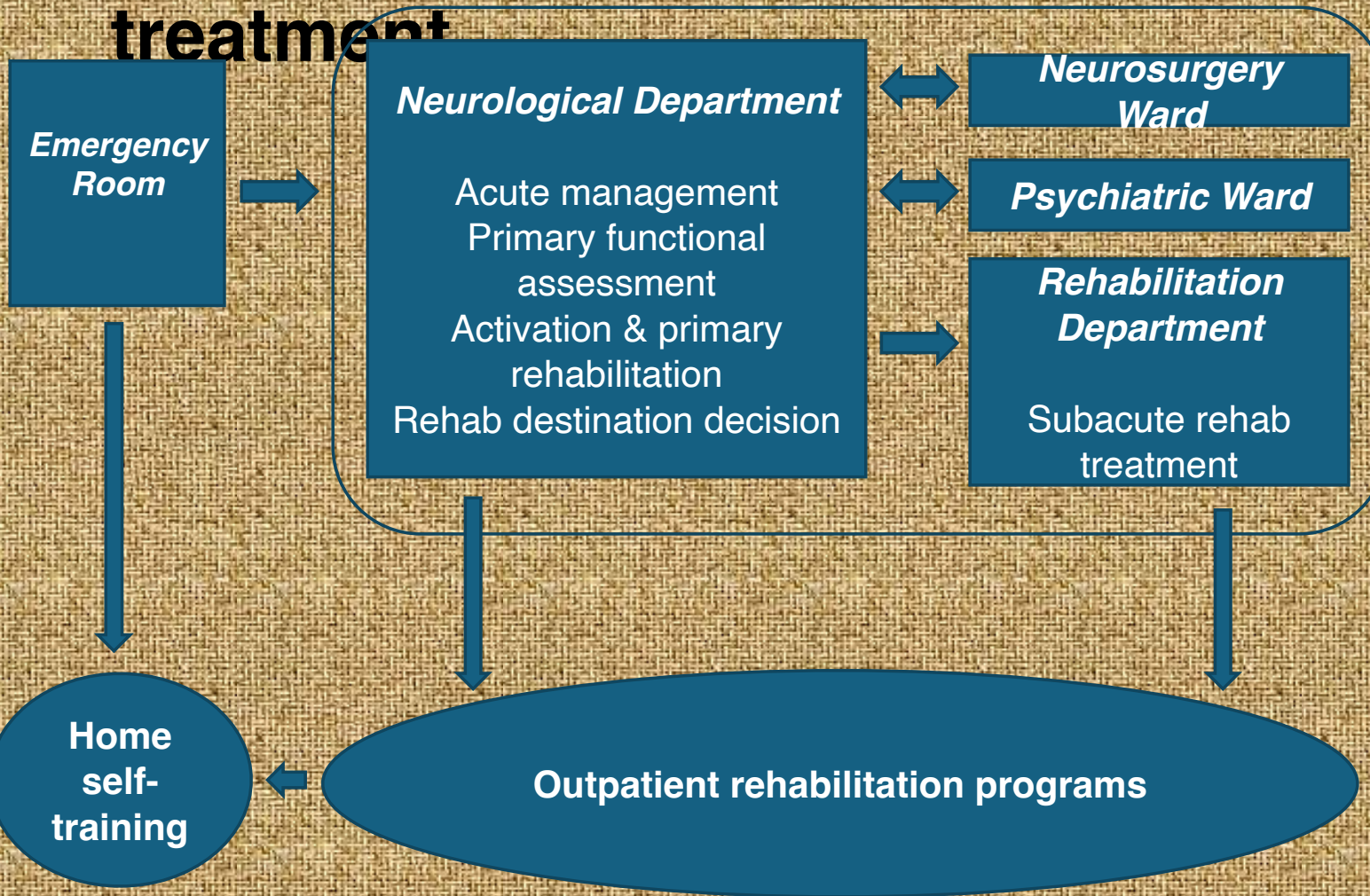
Strengthening

Rehabilitation

Step by step realistic goals' achievement program with appropriate feedback and patient's involvement



Soroka Brain Center in Nonorganic patients' treatment

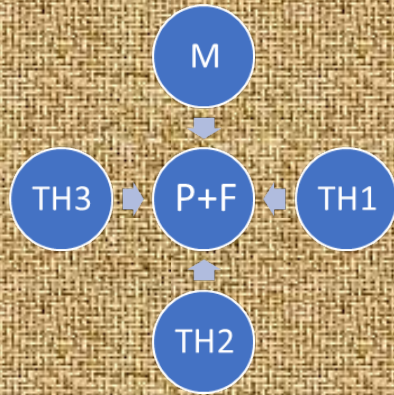


"All for one and one for all, united we stand divided we fall."

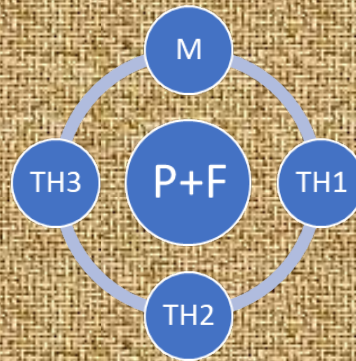
Un pour tous, tous pour un is a motto traditionally associated with the titular heroes of the novel *The Three Musketeers* written by Alexandre Dumas père, first published in 1844.

Intradisciplinary and multidisciplinary staff work

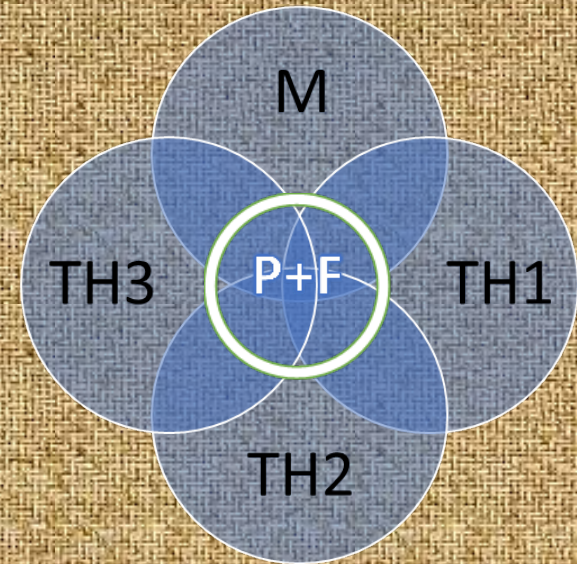
M - manager
TH - therapist
P+F - patient and family



+

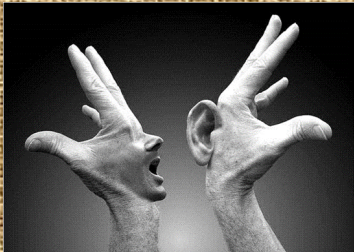


≠



1.

Communication



+

2. Respect

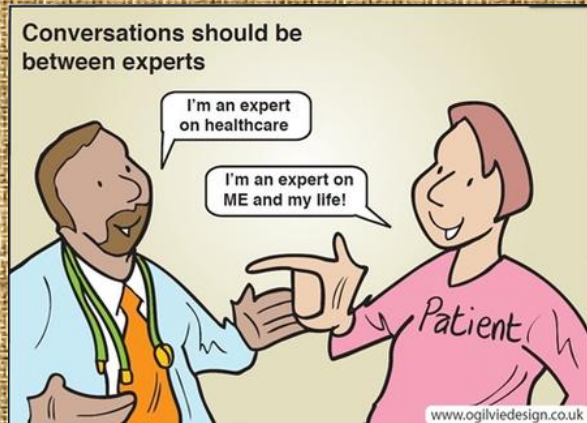


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3. Knowledge



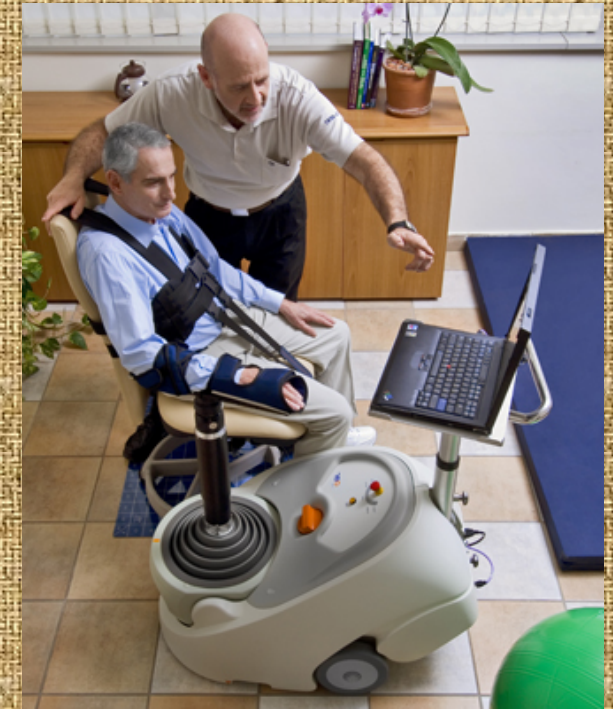
A “non-confrontive” approach with clear behavioral boundaries in most cases...



Use of multiple treatment techniques and technologies, double – tasking, gaming...



**Motor
tasks**

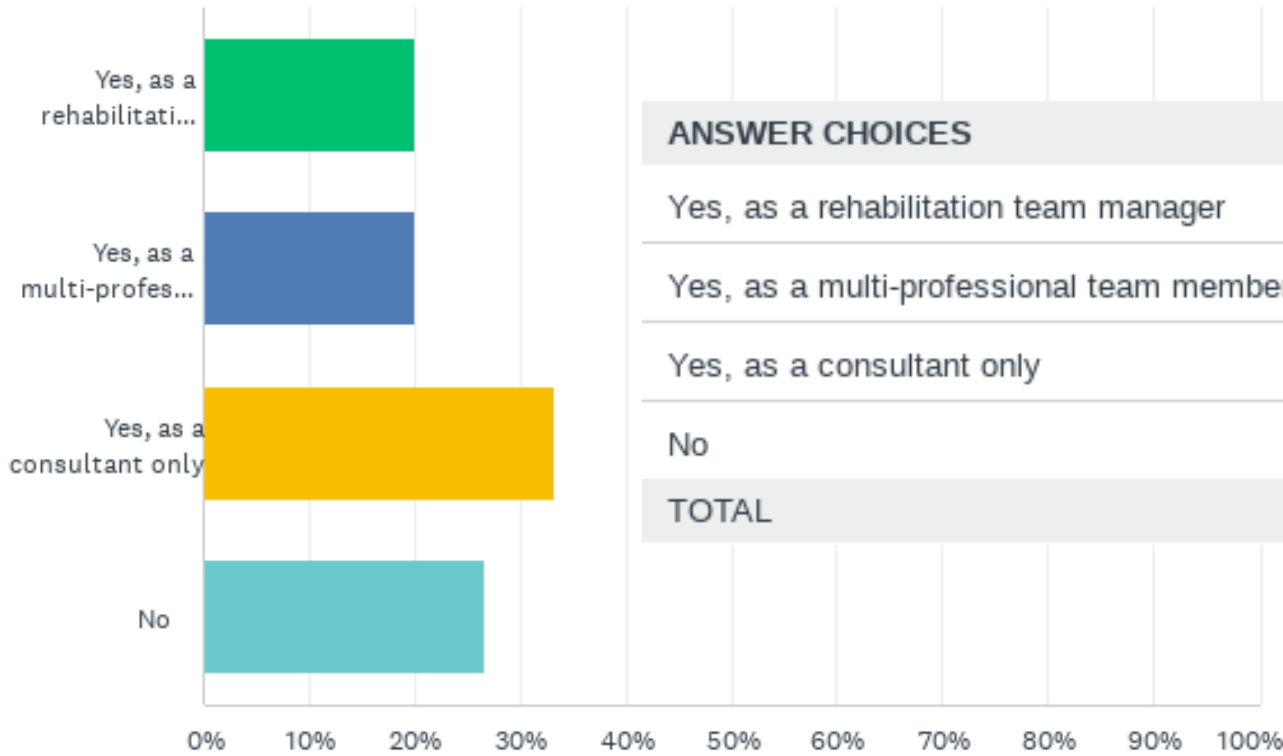


**Cognitive
tasks**

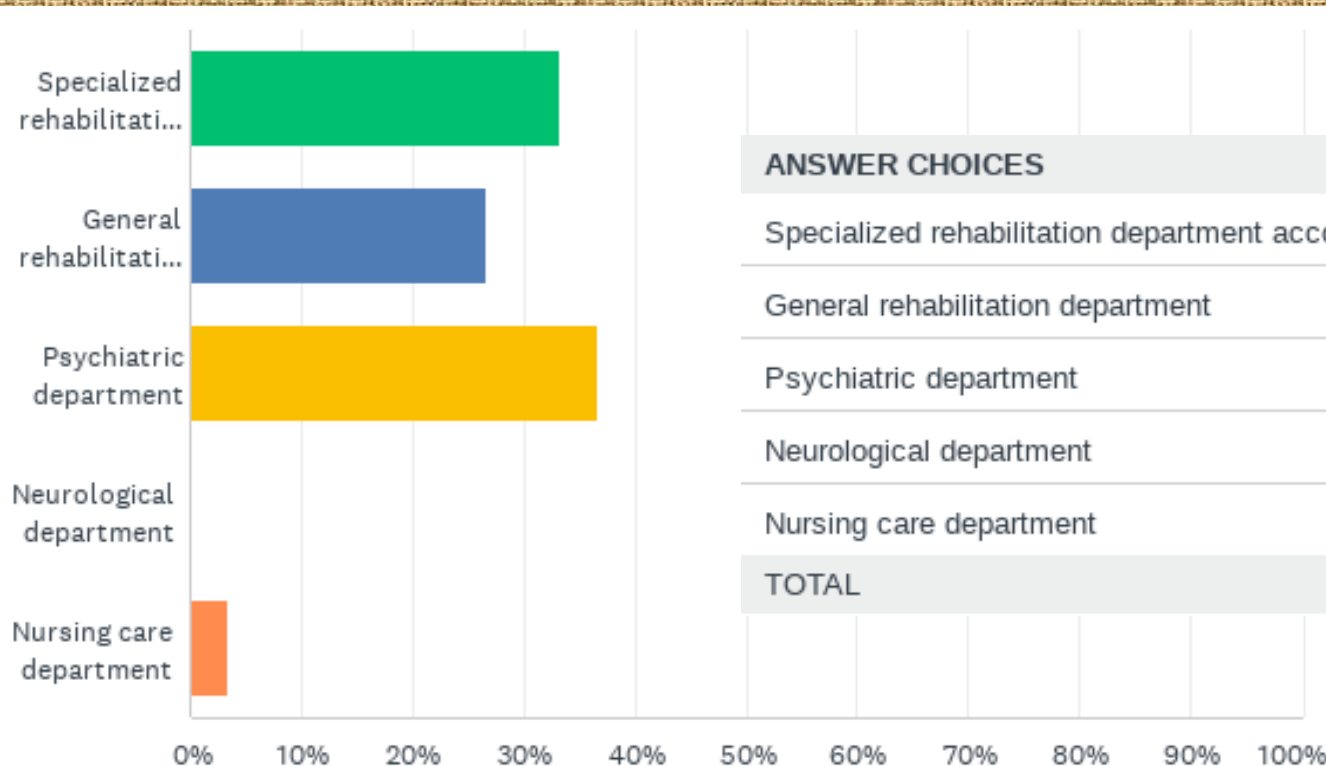
Basic principles in Rehabilitation of patients with Disorders of Nonorganic Origin



Q4: Is PRM doctor involved in medical rehabilitation of patient with Conversion?

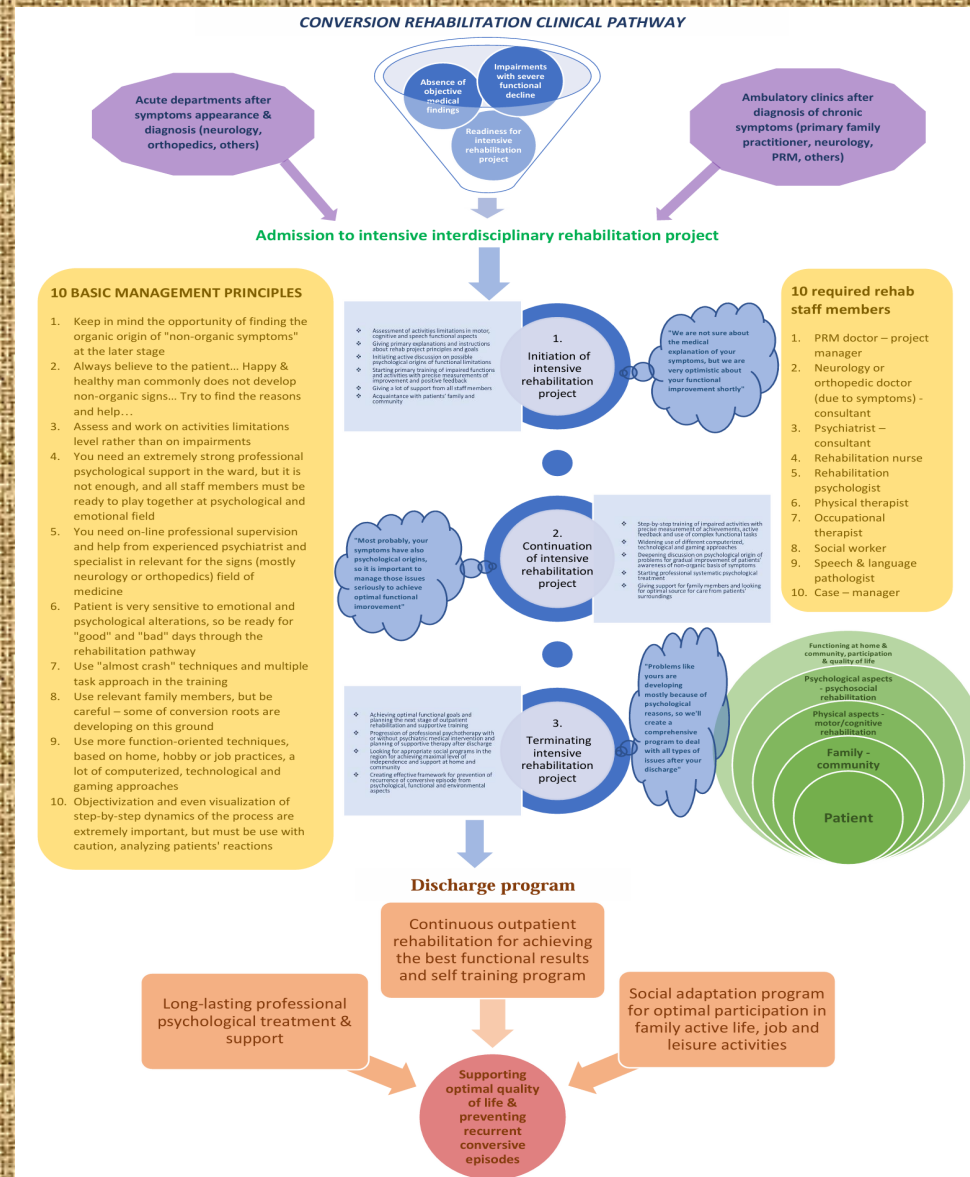


Q9: Patient with severe functional decline due to conversion disorder, requires inpatient medical rehabilitation, most probably will be admitted to:



ANSWER CHOICES	RESPONSES	
Specialized rehabilitation department according to type of injury	33.33%	10
General rehabilitation department	26.67%	8
Psychiatric department	36.67%	11
Neurological department	0.00%	0
Nursing care department	3.33%	1
TOTAL		30

CONVERSION REHABILITATION CLINICAL PATHWAY



Novel use of fMRI in the rehabilitation of conversion disorder

[Alan Friedman](#)  ^a  · [Noa Zitron-Emanuel](#) ^b · [Moti Salti](#) ^{c,d} · [Yacov Ezra](#) ^{e,f} · [Ilan Shelef](#) ^{e,g} · [Iuly Treger](#) ^{a,e}

CASE REPORT

- A 16-year-old female presented to the pediatric emergency room with left hemiplegia, left hemi anesthesia, facial droop, and dysarthria.
- The patient was a high school student living with both of her parents and a younger brother. She had a known diagnosis of ADHD, reported below-average academic achievements, and was described by her parents as friendly and popular. The patient also had a new boyfriend of whom her parents did not approve, which caused major family strife. Two months prior to admission, she had been hospitalized for a non-suicidal self-injury. She had taken several pills and immediately told a friend, and he called her mother. The patient stated that she had taken the pills because of a conflict with a friend but refused to elaborate. On the day of admission, the patient went to a restaurant with her family and friends, where she suddenly experienced the above symptoms. She was taken to the emergency room and found to have left hemiplegia and right facial “spasm”; the speech deficits had resolved.
- A brain MRI was normal and due to inconsistencies in the history and physical examination, the consulting neurologist suspected FND. She was admitted to the neurology department for observation, during which a psychiatrist and psychologist formally diagnosed conversion disorder with motor paralysis in accordance with DSM-5 criteria. She was then transferred to an inpatient rehabilitation unit where it was felt it would be more successful in addressing the somatic symptoms and empowering her to overcome her psychological defense mechanisms.
- The rehabilitative team consisted of a rehabilitation physician, psychologist, social worker, occupational-, speech-, and physical therapists. Psychological stressors were identified (current problematic relationship, social difficulties in school), but her cooperation was mostly formal, and despite intensive rehabilitation and psychological intervention, she did not improve.
- In fact, her symptoms worsened – with her developing pain in the plegic limbs. All attempts to address the psychological stressors or aspects of the patient’s condition exacerbated her pain. In an attempt to deepen our understanding of the patient’s condition, she underwent an fMRI scan in the third week of hospitalization.

METHODS & RESULTS

- The hospital's institutional review board approved the study. A block design was used to acquire functional imaging data. Motor and somatosensory stimulation were done during the acquisition of fMRI data. Tasks were targeted to the body parts with the greatest motor and sensory loss reported by the patient. The mirror region was stimulated on the asymptomatic side.
- The block design consisted of 3-minute scans (30 seconds without stimulation and 30 seconds with stimulation, repeated three times). The motor task consisted of flexion and extension of bilateral hand joints and dorsiflexion and plantar flexion of the bilateral ankle joints.
- Somatosensory stimulation was performed by one of her parents touching those body parts. The blocks were as follows: (a) Moving arm (b) Somatosensory stimulation of arm (c) Moving ankle (d) Somatosensory stimulation of ankle (e) Try to imitate paralysis in the right (asymptomatic) hand.
- During the motor tasks for the symptomatic side (left limbs), when asked to move the limb compared to resting state, there was no activation in the contralateral motor cortex (Figure 1). However, during the motor tasks for the asymptomatic (right) side, the contralateral (left) motor cortex was significantly activated (Right hand task: $P = 0.00034$ uncorrected, Talairach coordinates $x, y, z = -54, -13, 43$, cluster size = 109; Right leg task: $P < 0.0001$ uncorrected, Talairach coordinates $x, y, z = -5 -24 54$; cluster size = 1565), relative to the resting state.
- When trying to imitate the paralysis on the asymptomatic hand, only the premotor cortex and supplementary motor cortex showed significant activation, compared to at rest ($P = 0.005$ uncorrected, Talairach coordinates $x, y, z = 0 15 42$; cluster size = 254).

METHODS & RESULTS (CONTINUATION)

- During somatosensory stimulation of the symptomatic side only areas situated near the somatosensory cortex were significantly activated (Figure 2): the right premotor cortex and supplementary motor cortex, (situated just anterior to the primary motor cortex) with left hand stimulation ($P < 0.0001$ uncorrected, Talairach coordinates $x, y, z = -31, -17, 68$; cluster size = 136) and the right visuo-motor coordination and proprioception area, (situated posterior to the primary somatosensory cortex) with left leg stimulation ($P < 0.0001$ uncorrected, Talairach coordinates $x, y, z = 21, -45, 56$; cluster size = 467).
- In contrast, during the somatosensory stimulations of the asymptomatic side, the contralateral somatosensory cortex was significantly activated (Right hand stimulation: $P < 0.0001$ uncorrected, Talairach coordinates $x, y, z = -30, -33, 55$; cluster size = 424; Right leg stimulation: $P < 0.0001$ uncorrected, Talairach coordinates $x, y, z = -1, -28, 67$ cluster size = 833), relative to the resting state.
- In GO state, the contralateral cortex showed decreased activation when stimulation was applied to the symptomatic compared to the asymptomatic hand but did not reach statistical significance ($p > 0.05$).

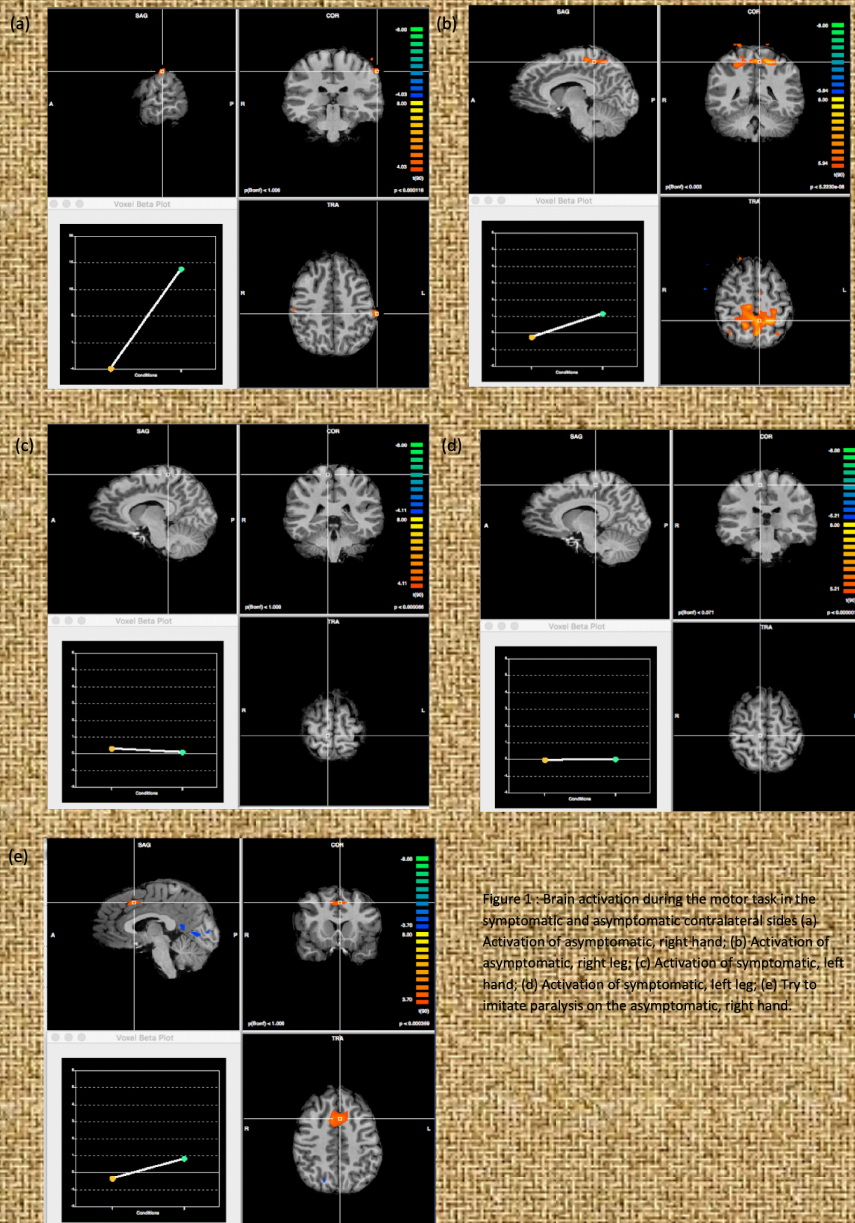


Figure 1: Brain activation during the motor task in the symptomatic and asymptomatic contralateral sides (a) Activation of asymptomatic, right hand; (b) Activation of asymptomatic, right leg; (c) Activation of symptomatic, left hand; (d) Activation of symptomatic, left leg; (e) Try to imitate paralysis on the asymptomatic, right hand.

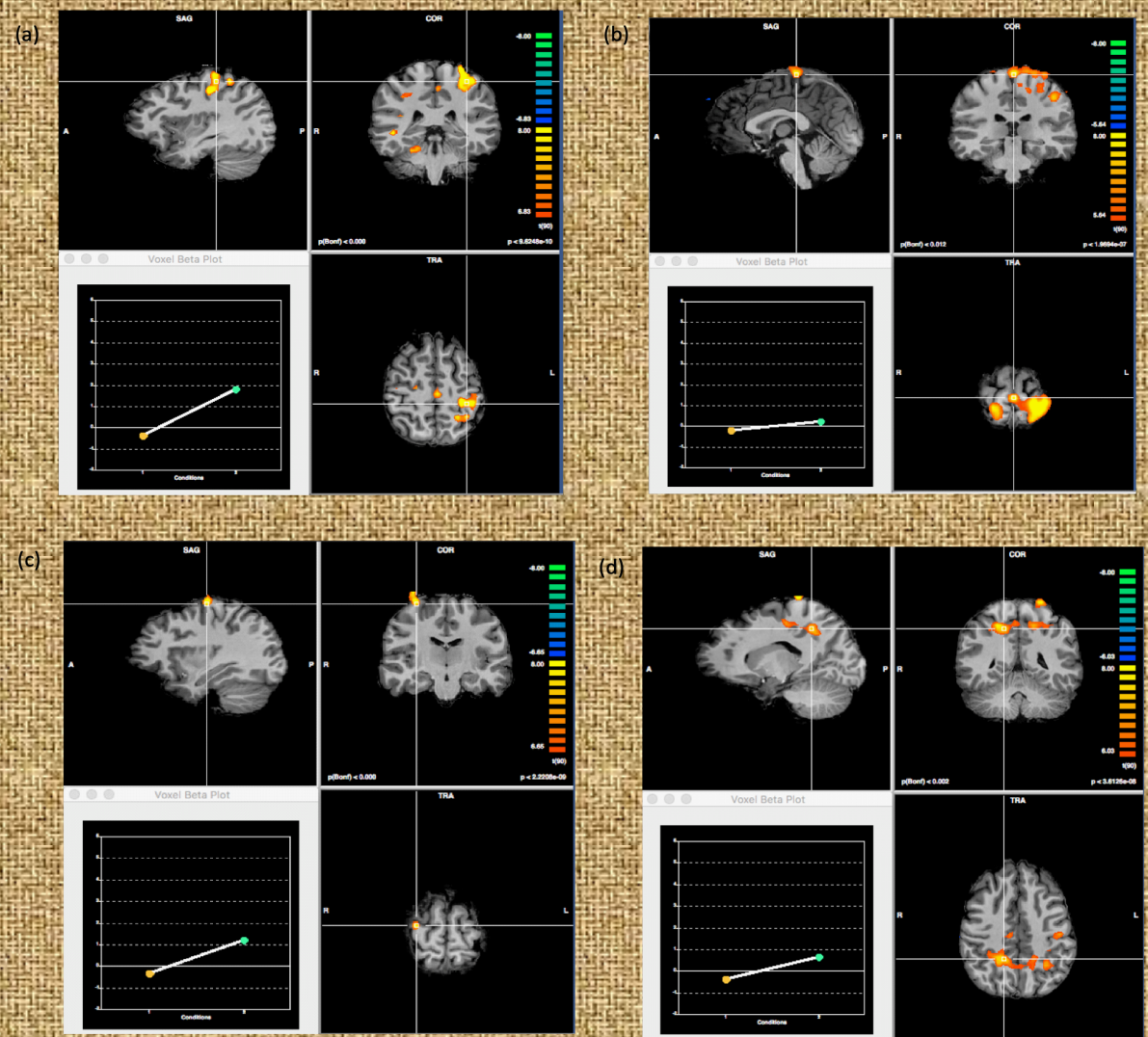


Figure 2: Brain activation during somatosensory stimulation in the symptomatic and asymptomatic, contralateral sides (a) Activation of asymptomatic, right hand; (b) Activation of asymptomatic, right leg; (c) Activation of symptomatic, left hand; (d) Activation of symptomatic, left leg.

FUNCTIONAL RESULTS

- Once we received the fMRI results, we were able to sit with the patient and her parents and visually explain what was happening in her brain. This enabled us to show her what she was unable to accept with verbal explanations – that there was a physiologic etiology for her weakness and it was not “just in her head”.
- This proved to be the therapeutic breakthrough for which we had hoped, as following our explanation, the patient’s symptoms were validated in her mind, and she became more invested in her rehabilitation program.
- She began to improve steadily and her FIM score improved from 79 to 109 (Not really true – this is for the whole admit more likely 90-109). Her strength improved from 0/5 in the left upper and lower extremities (except 1/5 in digits #1 and #2) to 5/5.
- She was discharged home shortly thereafter.

CONCLUSION

- This case is important in the treatment of FND patients.
- In our experience, one of the impediments to successfully treating these patients is their feeling that no one believes them; that they are malingering.
- We were able to prove to our adolescent patient that it was not an issue of believing her – we could actually prove to her and her parents that there were physiologic changes.
- This validation of her condition provided the psychological spark allowing her recovery to begin.
- We cannot recommend using a scarce resource like fMRI as a “show and tell” tool, but further research is warranted utilizing other means to objectively show the patient what the treating team knows to be occurring physiologically.

Thanks for your Attention and GOOD LUCK!