



# Development and Validation of the NSIT, A New Symptom Scale for Functional Neurological Disorder

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## INTRODUCTION

- Functional neurological disorder (FND) is characterized by neurological symptoms without known structural neurological damage.
- The wide range of symptoms reported by patients with FND has been a barrier to the development of measures to assess symptom burden and track response to therapy.<sup>1,2</sup>
- We report our experience with a flexible instrument designed to assess and track FND symptoms.

## METHODS

- We developed the Neurological Symptom Impact Tracker (NSIT, pictured to right), to assess and track FND symptom burden in the Indiana University Somatic Disorders Clinic.
- During clinic appointments from 2018 through 2020, 60 unique patients (42 with FND and 18 without, ages ranging 17 to 74 years) filled out the NSIT, with most completing at least one additional clinic measure including:
  - PHQ-9 depression measure (n = 55)
  - GAD-7 anxiety measure (n = 49)
  - NS catastrophizing scale (NSCS) (n = 46)
  - Somatization Scale (SSS8) (n = 47)
  - Psychological Flexibility (AAQ2) (n = 49)
  - Brief Personality Inventory (TIPI) (n = 44)
- NSIT frequency and intensity scores for the primary reported symptom were added to calculate NSIT-severity (NSIT-S) score.
- NSIT interference items (#2-4) were added to calculate NSIT-I scores
- Cronbach's alpha was calculated to assess internal scale validity
- Pearson's correlations between measures were calculated to assess NSIT construct validity.

## NEUROLOGICAL SYMPTOM IMPACT TRACKER

1) Neurological symptoms can take many forms. Common symptoms include numbness, tingling, other sensory disturbances, weakness, difficulty speaking or swallowing, difficulty walking, seizures or convulsions, involuntary movements, pain, and impaired memory. Please list up to 3 neurological symptoms that you have had over the past year, followed by how frequent and severe they have been in the **past week**.

Symptom	Frequency				Intensity		
	None	Several Days	Every Day	Multiple times/day	Mild	Moderate	Severe
1)	0	1	2	3	0	1	2
2)	0	1	2	3	0	1	2
3)	0	1	2	3	0	1	2

2) What number best describes how your symptoms have interfered with your **enjoyment of life** in the past week?

0	1	2	3	4	5	6	7	8	9	10
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0 = Did not interfere 10 = Completely interfered

3) What number best describes how your symptoms have interfered with your **general activity** in the past week?

0	1	2	3	4	5	6	7	8	9	10
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0 = Did not interfere 10 = Completely interfered

4) What number best describes how your symptoms have interfered with your **relationships** in the past week?

0	1	2	3	4	5	6	7	8	9	10
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0 = Did not interfere 10 = Completely interfered

5) How would you rate your neurological symptoms overall over the past week? (Circle One)

Much Worse	Moderately Worse	A Little Worse	Same	A Little Better	Moderately Better	Much Better
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## DISCLOSURE INFORMATION

The authors have no conflicts of interest to disclose. Please send any questions related to this poster to Dr. Bushey: [mabushey@iu.edu](mailto:mabushey@iu.edu)

## PATIENT CHARACTERISTICS

	FND (n = 42)	Non-FND (n = 18)
Age (mean)	41.7	47
Sex (female)	77%	72%
Race / Ethnicity		
• African American	14%	11%
• White	84%	84%
• Other Race	2%	5%
• Non-Hispanic	98%	100%
Trauma History (any)	77%	83%
• Physical	54%	28%
• Sexual	26%	28%
• Emotional	44%	72%
• Head Injury	19%	0%

## OUTCOME MEASURE SCORES

Measure	FND	Non-FND
NSIT-S	2.3 (1.0)	3.3 (0.8)
NSIT-I	15.1 (8.1)	17.6 (7.8)
NS Catastrophizing (NSCS)	26.1 (13.6)	25.2 (12.6)
Somaticizing (SSS-8)	13.6 (7.1)	14.6 (5.8)
Inflexibility (AAQ-2)	25.1 (12.5)	27.0 (10.5)
Depression (PHQ-9)	11.4 (6.7)	14.4 (6.5)
Anxiety (GAD-7)	10.3 (6.5)	13.2 (5.5)
TIPI-Neuroticism	4.3 (1.9)	4.8 (1.5)
TIPI-Extroversion	4.9 (1.7)	3.9 (1.5)
TIPI-Openness	4.9 (1.3)	4.9 (1.3)
TIPI-Agreeableness	5.6 (1.3)	4.8 (1.6)
TIPI-Conscientiousness	5.3 (1.4)	4.8 (1.4)

Scores are mean (SD). N (FND : Non-FND) for each scale: NSIT-S (42:18), NSIT-I (37:18), SSS8 (32:16), AAQ2 (32:16), PHQ9 (35:16), GAD7 (33:16), TIPI (29:16)

## SYMPTOMS REPORTED ON NSIT



Word Cloud generated by inputting the list of all symptoms reported by patients on the NSIT form into the Microsoft Word Pro Word Cloud add-in with a 100-word max setting.

## MEASURE CORRELATIONS

	FND (n = 42)		Non-FND (n = 18)	
	NSIT-S	NSIT-I	NSIT-S	NSIT-I
NSIT-I	0.1	-	0.31	-
NS Catastrophizing	0.21	0.55	0.32	0.75
Somatization (SSS8)	0.17	0.12	0.54	0.74
Inflexibility (AAQ-2)	-0.16	0.32	-0.04	0.21
Depression (PHQ-9)	-0.15	0.21	0.2	0.93
Anxiety (GAD-7)	-0.3	0.11	0.04	0.17
TIPI-Neuroticism	-0.15	0.23	0.01	0.43
TIPI-Extroversion	0.3	0.17	-0.13	-0.32
TIPI-Openness	0.16	0.22	-0.2	-0.15
TIPI-Agreeableness	0.01	-0.02	-0.22	-0.21
TIPI-Conscientiousness	0.28	-0.19	0.18	-0.07

## RESULTS

- The sample was predominantly female (75%), white (83.6%), and non-Hispanic (98.4%), with mean (SD) age 43.4 (14.9).
- A history of trauma was highly prevalent, with 78.7% reporting some form of physical, sexual, or emotional trauma.
- NSIT frequency scores averaged 2.6 (1.0), intensity scores 1.8 (0.7) and interference scores 15.8 (8.1).
- For NSIT, Cronbach's alpha was good, (0.73 for entire scale, 0.83 for interference subscale).
- In FND patients, Pearson correlations between NSIT scores and validated measures were between -0.5 and 0.5, suggesting NSIT is measuring a construct distinct from these other measures.

## DISCUSSION

Measures to assess FND symptoms are lacking. Our preliminary validation of the NSIT measure shows promise as a potential tool allowing quantitative assessment of FND symptoms and their interference and suggests a fully powered validation study of the NSIT would be warranted.

## REFERENCES

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