Development of the NICS Multi-Informant Clinical Formulation Toolkit

A Multi-Informant Approach to Characterizing Dysregulation Drivers Relevant to Neurodevelopmental CNS Trials

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METHODOLOGICAL ISSUE

Behavioral outcomes in neurodevelopmental CNS trials may reflect:

- Symptom burden from the underlying condition
- Contextual or environmental dysregulation
- Undetected physiological states (pain, hunger, fatigue)
- Sensory overload or hypo-reactivity
- Interoceptive processing differences
- Communication barriers masking internal states

Conventional symptom-focused rating scales may not systematically distinguish these contributors, increasing interpretive noise. NICS is designed to characterize potentially modifiable physiological, environmental, sensory, communication, and interoceptive contributors that conventional severity measures may leave Unmeasured.

Intended population: children, adolescents, and adults with neurodevelopmental conditions, including those with intellectual disability or complex communication needs.

INTRODUCTION & AIMS

1. Convert the NEEDS framework into a structured multi-informant formulation toolkit (NICS)
2. Define domains, anchors, profile outputs, and a standardized administration pathway
3. Propose a staged psychometric validation roadmap for CNS trial methodology

SCOPE & SAFEGUARDS

- **NOT a diagnostic instrument**
- **NOT a validated psychiatric severity scale**
- **NOT a standalone basis for clinical decisions**
- **NOT a tool for causal attribution**

IS a preliminary formulation toolkit for profile-based hypothesis generation

Urgent psychiatric risk protocols take precedence. Domain patterns may reflect interacting contributors rather than a single dominant mechanism.

NEEDS DOMAIN MODEL

- **N** Neurodevelopmental Profile & Regulation Style
- **E_1** Environmental Fit & Sensory Load
- **E_2** Education & Shared Understanding
- **D** Detective Work Before Prescribing Drugs – Medical, physiological & functional Review
- **S** Sleep · Sensory Regulation · Strengths
- **I** Interoceptive Processing Extension

Items characterize the clinical prominence of potential contributors within each domain. Domain profile is prioritized over a single total score.

TOOLKIT ARCHITECTURE — 5 FORMS

NICS-C	**Clinician Full Scale** 31 items · 6 domains
NICS-CG	**Caregiver Form** 15 items
NICS-Ch	**Child Self-Report** 8 items
NICS-A	**Adult Self-Report** 15 items
NICS-SF	**Short Form** 10 items · 3–5 min

Shared 6-domain structure · Informant-specific wording · Profile-based output

SCORING ANCHORS

- **0** Not present / developmentally expected
- **1** Present with limited impact on functioning
- **2** Regular contributor to current presentation
- **3** Prominent contributor with substantial functional impact
- **NI** Insufficient information to rate — not scored as 0

Rating window: past 2–4 weeks. NI may be used when available information is insufficient to rate any item; it is not scored as 0.

INSTRUMENT DEVELOPMENT PROCESS

1. **Conceptual Model** NEEDS framework mapped to dysregulation drivers across neurotype, physiology, environment and interoceptive processing.
2. **Item Generation** 31 clinician items plus caregiver, child, adult and short forms with informant-specific wording.
3. **Construct Refinement** Interoceptive processing differences separated from unmet physiological needs as distinct constructs.
4. **Administration Protocol** Multi-source rating, 2–4 week window, developmental anchors, NI permitted.
5. **Profile Output** Domain-first interpretation and clinical formulation prompt replacing single aggregate score.

DOES IT HURT? — MEDICAL SCREEN

- **D** Digestive
- **O** Otorhinolaryngological
- **E** Epilepsy / neurological
- **S** Sleep
- **I** Infection
- **T** Temperature
- **H** Headache
- **U** Urinary
- **R** Reflux / respiratory
- **T** Thyroid / metabolic

Used when the Domain D profile raises concern for unassessed medical or physiological contributors. Positive findings documented and addressed before attributing behavior solely to psychiatric dysregulation.

DEVELOPMENT STATUS

Component	Status
Conceptual domain mapping	✔ Completed
Initial item generation	✔ Completed
Multi-informant adaptation	✔ Completed
Author methodological review	✔ Completed
Expert content validity review	⏳ Planned
Cognitive debriefing	⏳ Planned
Feasibility & reliability study	⏳ Planned
Construct validation	⏳ Planned

Expert content-validity review is the next planned phase after source-language item stabilization.

PRELIMINARY DEVELOPMENT RESULTS

Outputs of the structured development process:

- **5** Informant-specific versions developed (clinician, caregiver, child, adult, short form)
- **31** Clinician-rated items across 6 profile domains
- **6** Items in the interoceptive processing extension module
- **4** Anchored response options (0–3); NI used when available information is insufficient to rate
- **7** Step standardized administration procedure
- **↑** Conceptual and item-level separation of interoceptive processing differences from unmet physiological needs

Multidisciplinary development integrating expertise in neurodevelopmental psychiatry, clinical trial methodology and psychometrics.

PROPOSED VALIDATION ROADMAP

Source-language item stabilization precedes cultural & linguistic adaptation.

Stage 1 — **Content Validity**
Expert panel (clinicians, caregivers, neurodivergent individuals); content validity index per item.

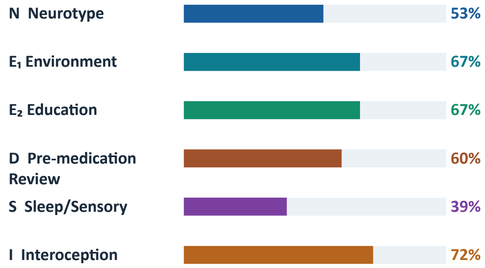
Stage 2 — **Feasibility & Inter-Rater Reliability**
20–30 cases or vignettes; two independent raters; weighted kappa / ICC.

Stage 3 — **Construct Validity**
Convergence with interoception, alexithymia, sleep, sensory and functional measures.

Parallel pathway: Cultural & linguistic adaptation begins after source-language item stabilization (forward-back translation; cognitive interviews).

ILLUSTRATIVE DOMAIN PROFILE — EMMA CASE

Illustrative composite case — not validation data



% of domain maximum · Domains have different item counts · Not psychometrically equivalent

Profile-Generated Hypothesis: Elevated Interoception, Environment and Medical Review domain scores generated a testable hypothesis linking episode timing, physiological needs and environmental pacing. Scheduled snacks and breaks were *followed by* a marked reduction in classroom outbursts. No medication change was introduced. This illustrates how the NICS profile may support targeted hypothesis generation — not causal attribution.

POTENTIAL ROLE IN CNS TRIALS

- Potential adjunctive baseline characterization beyond categorical diagnosis — documenting physiological, interoceptive, sensory and environmental contributors
- Potential support for contextual interpretation of behavioral endpoints and exploratory moderator analyses
- Trial-center training on neurodevelopmental formulation before behavioral outcome assessment

Currently proposed as an adjunctive characterization tool — not as a primary efficacy endpoint.

CONCLUSIONS

- NICS Toolkit v2 provides a structured and standardized formulation pathway across 5 informant-specific versions
- Domain profile model reduces reliance on a single aggregate score and makes physiological, interoceptive, environmental, communication, and neurodevelopmental contributors explicit
- NICS is ready to enter formal content-validity testing, then feasibility and inter-rater reliability studies — not for diagnostic, causal or severity interpretation
- Participatory refinement with neurodivergent individuals, caregivers, and clinicians is a required next step

REFERENCES & DISCLOSURES

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