

Does the Multidimensional Burden of Post-Stroke Dysphagia Differ Between the Acute and Subacute Phases? A Cross-Sectional, ICF-Based Comparison of 187 Adults

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Dysphagia

Does the Multidimensional Burden of Post-Stroke Dysphagia Differ Between the Acute and Subacute Phases? A Cross-Sectional, ICF-Based Comparison of 187 Adults --Manuscript Draft--

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Abstract:	Background. Clinicians often assume that swallowing is most impaired in the first days after stroke and eases in the subacute phase. That view rests largely on intake-based or screening measures. We asked whether the broader, multidimensional burden of post-stroke dysphagia differs between phases when assessed with an International Classification of Functioning, Disability and Health (ICF) instrument. Method. In a secondary cross-sectional analysis of the ICF-based Dysphagia Assessment Tool (ICF-DAT) validation cohort, 187 consecutive adults with first-ever stroke were each assessed once on the 57-code ICF-DAT (0–4 qualifier scale). Seventy-four were acute (≤ 7 days post-stroke) and 113 subacute (days 8–30). Five core qualifiers (ingestion b510, muscle tone b735, speaking d330, eating d550, drinking d560) were compared by one-way analysis of variance (ANOVA) with partial eta-squared as effect size; articulation (b320) was not recorded in the source dataset and was excluded. Results. Acute means were slightly higher (more impaired) on four of five qualifiers; ingestion differed negligibly in the opposite direction. No comparison was significant (all $p > 0.05$; partial $\eta^2 \leq 0.015$). Severity was Mild 0.5%, Moderate 72.7%, Severe 26.7% overall; severe dysphagia occurred in 25.7% of acute and 27.4% of subacute patients. Environmental factors were barriers for every patient in both phases. Conclusions. At group level, multidimensional post-stroke dysphagia burden did not differ significantly between phases. This cross-sectional comparison describes group similarity, not within-patient recovery, and non-significance is not proof of equivalence. Calendar phase alone should not triage assessment intensity; thorough, context-focused assessment remains warranted across both phases.
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Does the Multidimensional Burden of Post-Stroke Dysphagia Differ Between the Acute and Subacute Phases? A Cross-Sectional, ICF-Based Comparison of 187 Adults

Running head

Phase comparison of post-stroke dysphagia

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Competing interests

The authors jointly hold the copyright registration for the ICF-based Dysphagia Assessment Tool (ICF-DAT) manual (Indian Copyright Office Registration No. LD-20250171253). The authors have no other relevant financial or non-financial interests to disclose.

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki (2013 revision). Approval was granted by Yenepoya Ethics Committee–1 (YEC-1), Yenepoya (Deemed to be University), Mangaluru, India (Protocol No. YEC-1/2022/143).

Consent to participate

Written informed consent was obtained from every participant on a committee-approved English or Kannada consent form or, where a stroke-related neurological deficit prevented this, from a legally authorised representative.

Consent to publish

Not applicable. No individually identifiable patient images or personal details are published.

Data availability

The datasets analysed during the current study are available from the corresponding author on reasonable request. Individual-level clinical data are not publicly archived because of privacy restrictions under the ethics approval.

Authors' contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Hemaraja Nayaka S. The first draft of the manuscript was written by Hemaraja Nayaka S, and Vijayalakshmi Subramaniam and Jayashree Bhat critically revised the work for important intellectual content. All authors read and approved the final manuscript.

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Running head: PHASE COMPARISON OF POST-STROKE DYSPHAGIA

Does the Multidimensional Burden of Post-Stroke Dysphagia Differ Between the Acute and Subacute Phases? A Cross-Sectional, ICF-Based Comparison of 187 Adults

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Abstract

Background. Clinicians often assume that swallowing is most impaired in the first days after stroke and eases in the subacute phase. That view rests largely on intake-based or screening measures. We asked whether the broader, multidimensional burden of post-stroke dysphagia differs between phases when assessed with an International Classification of Functioning, Disability and Health (ICF) instrument.

Method. In a secondary cross-sectional analysis of the ICF-based Dysphagia Assessment Tool (ICF-DAT) validation cohort, 187 consecutive adults with first-ever stroke were each assessed once on the 57-code ICF-DAT (0–4 qualifier scale). Seventy-four were acute (≤ 7 days post-stroke) and 113 subacute (days 8–30). Five core qualifiers (ingestion b510, muscle tone b735, speaking d330, eating d550, drinking d560) were compared by one-way analysis of variance (ANOVA) with partial eta-squared as effect size; articulation (b320) was not recorded in the source dataset and was excluded.

Results. Acute means were slightly higher (more impaired) on four of five qualifiers; ingestion differed negligibly in the opposite direction. No comparison was significant (all $p > 0.05$; partial $\eta^2 \leq 0.015$). Severity was Mild 0.5%, Moderate 72.7%, Severe 26.7% overall; severe dysphagia occurred in 25.7% of acute and 27.4% of subacute patients. Environmental factors were barriers for every patient in both phases.

Conclusions. At group level, multidimensional post-stroke dysphagia burden did not differ significantly between phases. This cross-sectional comparison describes group similarity, not within-patient recovery, and non-significance is not proof of equivalence. Calendar phase alone should not triage assessment intensity; thorough, context-focused assessment remains warranted across both phases.

Keywords: deglutition disorders; stroke; International Classification of Functioning, Disability and Health; acute care; outcome assessment

Introduction

Oropharyngeal dysphagia is one of the most common consequences of stroke and one of the most dangerous. A recent meta-analysis of 42 studies and more than 26,000 patients placed the pooled prevalence at 42% in the acute phase, and patients with dysphagia carried roughly fourfold higher odds of both pneumonia and death [1]. Earlier cohort work established the same association between post-stroke dysphagia and pulmonary complications [2]. The downstream costs are well documented: aspiration pneumonia, malnutrition, dehydration, longer hospital stays, and repeated readmissions [3]. For the speech-language pathologist, identifying and managing the disorder early is therefore not a routine formality but a safety priority.

A widely held clinical expectation shapes how services respond to this problem. Swallowing is assumed to be most impaired in the first hours and days after stroke and to improve as the patient moves from the acute into the subacute phase, helped by early spontaneous neurological recovery; roughly half to two-thirds of patients regain functional swallowing within the first weeks [4]. This expectation has practical consequences. Acute stroke units are resourced for rapid screening, and patients still in hospital two or three weeks after onset are often presumed to be recovering, with swallowing review treated as a lower priority. The difficulty is that most of the evidence behind this picture rests on screening tests and intake-based scales that describe a narrow slice of the disorder, usually whether the airway is safe or whether oral feeding has resumed.

Swallowing disability is wider than airway safety and oral intake. The ICF model frames functioning as the product of body functions and structures, activities and participation, and the environment in which the person lives and is cared for [5]. Applied to dysphagia, this means that a patient who is nil by mouth in an acute ward and one who is taking a modified diet on a rehabilitation ward may differ on intake scales while sharing severe limitations in eating, drinking, speaking, social participation, and access to trained staff. Patient-reported tools in common use do not close this gap. A scoping review of dysphagia outcome measures after stroke found that the two instruments used most often, the SWAL-QOL and the EAT-10, do not directly assess the influence of environmental factors at all [6].

If the functional burden of post-stroke dysphagia is measured across all of these dimensions rather than through intake alone, does it actually differ between the acute and subacute phases? To our knowledge this has not been tested directly with a full ICF-based instrument in a single cohort. In a secondary analysis of the validation cohort of the ICF-based Dysphagia Assessment Tool (ICF-DAT), we compared the acute and subacute sub-cohorts of 187 consecutive adults across five core swallowing and communication qualifiers, across the overall severity distribution, and across the environmental-factor profile.

Method

Design and Setting

This was a secondary, cross-sectional, phase-stratified analysis of data collected for the ICF-DAT validation study. Reporting follows the STROBE guidance for cross-sectional studies (Online Resource 1). Data were collected at a tertiary referral centre in southern India between October 2023 and February 2024. The study was reviewed and approved by the institutional ethics committee (approval details on the Title Page) and was conducted in accordance with the Declaration of Helsinki (2013 revision). Written informed consent was obtained from every participant on a committee-approved English or Kannada consent form or, where a stroke-related neurological deficit prevented this, from a legally authorised

representative. Because the design is cross-sectional, with different patients in each phase, the comparison describes group differences at a single assessment and cannot track change within individual patients over time.

Participants

We enrolled consecutive adults aged 18 years or older with radiologically documented first-ever stroke (computed tomography or magnetic resonance imaging) with aetiology as recorded, presenting within 30 days of onset and flagged by the clinical team for suspected dysphagia. Patients were excluded if they had a premorbid swallowing disorder, a neurodegenerative condition, a known head and neck malignancy, a tracheostomy, or a Glasgow Coma Scale score below 8. Of 211 patients screened, 24 were excluded (12 with prior stroke, 6 with a Glasgow Coma Scale score below 8, 4 with severe global aphasia precluding assessment, and 2 with a tracheostomy), leaving 187 participants (Fig. 1). All assessments were completed during the inpatient admission; no community or home-based assessments were included.

Phase Classification

Stroke phase was defined by the interval between symptom onset and assessment using an exclusive boundary: acute = ≤ 7 days post-stroke; subacute = days 8–30. Day 7 was assigned to the acute phase only. The 7-day threshold follows widely used conventions in stroke rehabilitation research and corresponds to the period over which the largest share of early spontaneous swallowing recovery is reported [4].

Instrument

The ICF-DAT is a 57-code ICF-based dysphagia assessment protocol that was content-validated for post-stroke use through a three-round modified Delphi process with expert speech-language pathologists. It covers 18 body-function codes, 11 body-structure codes, 11 activity and participation codes, and 17 environmental-factor codes. Each code is rated on the standard ICF qualifier scale, from 0 (no impairment or no barrier) to 4 (complete impairment or complete barrier). Environmental factors are

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4 additionally rated as barriers or facilitators. In this cohort, environmental (e) codes were rated at the
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6 service/ward level as institutional barriers applying to the admission setting rather than as independent
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8 patient-level observations. In the parent validation cohort the instrument showed strong internal
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10 consistency (Cronbach's $\alpha = 0.901$), test–retest reliability (intraclass correlation coefficient = 0.901), and
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12 content validity (scale-level content validity index = 0.92); the parent ICF-DAT validation and
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14 psychometrics study is not yet published in a peer-reviewed journal. The Functional Oral Intake Scale
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16 (FOIS) [7] was administered to every patient alongside the ICF-DAT for comparison. The present
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18 analysis is a secondary, phase-stratified use of that validation cohort.
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22 23 **Outcome Measures for This Analysis**

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25 The phase comparison focused on five core qualifiers selected a priori as the ingestion and
26
27 communication functions spanning body-function and activity domains most central to clinical
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29 swallowing decisions: ingestion functions (b510), muscle-tone functions (b735), speaking (d330), eating
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31 (d550), and drinking (d560). Articulation functions (b320) were not recorded in the source clinical dataset
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33 (0 of 187 non-missing) and were therefore excluded from the phase ANOVA, Table 2, and Fig. 2. An
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35 overall dysphagia severity category (Mild, Moderate, or Severe) was taken from the clinical master chart
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37 field SeverityofDysphagia; the master contains no none-to-complete ordinal scale, and severity was not
38
39 recomputed from qualifier composites for this secondary analysis. The environmental-factor profile was
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41 summarised across all 17 environmental codes. The complete ICF-DAT domain mean scores for the
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43 cohort are provided in Online Resource 2.
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47

48 49 **Statistical Analysis**

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51 Analyses were performed in IBM SPSS Statistics version 25. Continuous qualifier scores were
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53 compared between the acute and subacute groups by one-way analysis of variance, with partial eta-
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55 squared reported as the effect size. Partial η^2 values near 0.01 indicate a small effect. The categorical
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57 severity distribution was compared by Pearson chi-square, with Cramer's V as the effect size. No
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59 correction for multiple comparisons was applied; because all comparisons were non-significant,
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correction would not change the conclusions. A two-sided alpha of 0.05 was used throughout. No imputation was performed, as the ICF-DAT was completed in full for all enrolled patients.

Results

Sample Characteristics

The 187 participants had a mean age of 59.1 years (standard deviation 13.7); 123 (65.8%) were men. Stroke aetiology as recorded (Stroke_Aetiology_Corrected) was Unspecified CVA in 138 patients (73.8%), ischaemic in 20 (10.7%), haemorrhagic in 14 (7.5%), and Non-stroke / Other in 15 (8.0%); the predominance of Unspecified CVA reflects incomplete radiological subtype documentation in the source chart rather than a CT/MRI infarct-typing algorithm applied here. Seventy-four patients (39.6%) were in the acute phase and 113 (60.4%) in the subacute phase. The two groups did not differ significantly in age or sex distribution (both $p > 0.05$). Table 1 summarises the cohort.

Overall Severity and the Limits of Intake-Based Scoring

Across the whole cohort the recorded severity distribution was Mild in 1 patient (0.5%), Moderate in 136 (72.7%), and Severe in 50 (26.7%); there was no none-to-complete ordinal scale in the master chart. The FOIS, by contrast, proved largely uninformative in this inpatient setting. A total of 180 patients (96.3%) were recorded at FOIS Level 1 (nothing by mouth); this ceiling largely reflects protocolised nil-by-mouth (NBM) practice in this inpatient setting, which limited discrimination among patients who differed substantially on the multidimensional assessment. Only 7 patients (3.7%) were at a higher level. The FOIS therefore could not distinguish severity within the cohort, which is itself a reason to prefer a broader instrument in the acute and subacute inpatient context.

Phase Comparison Across Core Qualifiers

Acute patients were slightly more impaired than subacute patients on muscle tone, speaking, eating, and drinking; ingestion means were nearly identical across phases. All differences were small and

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4 none reached statistical significance (all $p > 0.05$). The largest effects (muscle tone, speaking, eating, and
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6 drinking) were $F(1, 185) = 2.83$, $p = 0.094$, partial $\eta^2 = 0.015$. Ingestion was 1.3 (SD 0.4) in both phases,
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8 $F(1, 185) = 0.07$, $p = 0.792$. Articulation (b320) was excluded because it was not recorded. Table 2 and
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10 Fig. 2 report the full comparison.
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14 **Severity Distribution by Phase**

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16 The overall severity distribution did not differ materially between phases. Severe dysphagia was
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18 present in 25.7% of acute patients (19/74: Moderate 55, Severe 19; no Mild) and 27.4% of subacute
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20 patients (31/113: Mild 1, Moderate 81, Severe 31), $\chi^2(2, N = 187) = 0.75$, $p = 0.69$, Cramer's $V = 0.063$.
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22 The near-identical severe proportions underscore group-level similarity rather than a clear acute-to-
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24 subacute severity drop.
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28 **Environmental Factors in Both Phases**

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31 Every one of the 187 patients was rated as facing barriers across all 17 environmental codes, with
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33 no variability between patients and none between phases (standard deviation 0.0), consistent with
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35 service/ward-level rating of institutional barriers for the admission setting. Barriers were most severe for
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37 health services, systems, and policies and for the availability of trained health professionals. Because
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39 environmental codes were not independent patient-level observations, identical barrier profiles across
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41 phases should not be read as an epidemiologic discovery of between-phase environmental similarity; we
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43 return to this dual reading below. Table 3 lists the environmental domains rated as barriers.
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48 **Discussion**

49 50 **Main Finding**

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52 In 187 consecutive adults assessed with the full ICF-based instrument, the multidimensional
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54 burden of post-stroke dysphagia did not differ significantly between the acute and subacute phases at the
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56 group level. Acute patients were marginally more impaired on most core qualifiers, which fits the clinical
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4 expectation, but the gradient was small, statistically non-significant, and small by effect size (partial $\eta^2 \leq$
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6 0.015). The overall severity distribution and the environmental-barrier profile were similar across the first
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8 month.
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10 11 **Interpretation** 12 13

14 Three cautions frame this result. First, the design is cross-sectional and between-groups: the acute
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16 and subacute patients are different individuals, so the data describe how the two phases look at a single
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18 assessment rather than how any one patient recovers. A within-patient study could still reveal meaningful
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20 improvement that a group comparison conceals. Second, a non-significant difference is not the same as
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22 proven equivalence. With 74 acute and 113 subacute patients the study had limited power to detect small
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24 between-group differences, so the data are better read as failing to show the expected acute-to-subacute
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26 drop than as positive proof that the phases are identical. Third, the assessment was conducted in an
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28 inpatient setting where a nil-by-mouth protocol constrained oral intake, which may compress variation on
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30 intake-linked qualifiers. With those caveats in mind, the finding still carries a clear message. If subacute
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32 patients were recovering quickly across the full range of swallowing disability, a larger and clearer group
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34 difference would be expected. Instead, eating, drinking, speaking, and the surrounding environmental
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36 barriers remained severe well into the subacute phase.
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42 This reading is consistent with the wider literature in an instructive way. Spontaneous recovery of
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44 airway safety and oral intake in the first weeks after stroke is real and well described [4], but it is typically
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46 measured on exactly the narrow scales that our cohort showed to be uninformative in the acute inpatient
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48 context. When dysphagia is viewed through participation and environmental lenses, recovery looks
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50 slower and less complete. Systematic-review evidence indicates that greater dysphagia severity, bilateral
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52 lesions, and overall stroke severity predict persistent dysphagia rather than early resolution [8], so
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54 subacute presentation does not by itself signal recovery. Trajectory modelling of ICF-based disability data
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56 has shown that stroke patients with dysphagia tend to follow the most severe and slowest-improving
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58 recovery paths [9], and the absence of environmental-factor coverage in standard patient-reported
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measures means that the part of the disability that changed least in our data is also the part that routine tools do not capture [6]. The stakes of that overlooked burden are not trivial: in a prospective cohort of 1,117 patients, post-stroke dysphagia independently predicted dependency in daily activities and failure to return to work at three months [10].

The Uniform Environmental Profile

The complete absence of variability in the environmental ratings deserves direct comment and should not be framed as a between-phase epidemiologic discovery. It may reflect a genuine, service-level constant: the same institutional pathway, with limited access to speech-language pathology and dysphagia-trained staff, applied to every patient in both phases. More directly, it reflects the rating procedure used here—environmental (e) codes were assigned at the service/ward level as barriers applying to the admission setting rather than as 187 fully independent patient-level observations. Both readings caution against treating the uniform profile as evidence that environments were independently sampled and found similar; future work should resolve this with patient-level environmental scoring.

Clinical Implications

Several practical points follow for speech-language pathology and multidisciplinary dysphagia practice, framed as assumption-challenging rather than as service-policy prescriptions. Calendar phase alone should not triage assessment intensity: group-level non-significant similarity between acute and subacute cohorts does not equal within-patient recovery, and a patient assessed two or three weeks after stroke may still present with severe multidimensional swallowing disability. Multidomain assessment should therefore remain available across the care pathway rather than being retired on the basis of calendar time. Identifying persisting disability in the subacute phase remains clinically relevant, because several swallowing interventions show benefit within the first three months after stroke [11]. Intake-based scales such as the FOIS, while useful in rehabilitation settings where diet is progressively liberalised, are poorly suited to the acute and subacute inpatient phase, where protocolised nil-by-mouth practice produces a Level 1 ceiling that limits discrimination. A multidimensional ICF-based assessment gives a

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4 fuller picture. Environmental barriers that applied across both phases, particularly limited access to
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6 trained staff and services, are potentially modifiable and deserve attention alongside impairment; these
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8 data do not, however, justify specific FTE or staffing prescriptions. Qualitative accounts of patients living
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10 with post-stroke dysphagia likewise identify limited professional services as a defining feature of their
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12 experience [12].
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15 16 **Strengths and Limitations**

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19 The strengths of the study include a substantial consecutive cohort for a single-centre dysphagia
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21 study, use of a multidimensional instrument with strong psychometric properties, complete data on all
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23 enrolled patients, and a pre-specified phase comparison. The limitations should temper the conclusions.
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25 The study was conducted at a single tertiary centre in southern India, which limits generalisability. The
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27 design is cross-sectional and cannot establish within-patient recovery trajectories, and the sample, while
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29 adequate overall, gives limited power for small subgroup differences. Because only inpatients were
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31 enrolled, the subacute group is enriched for patients who remained hospitalised; those who recovered
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33 sufficiently for earlier discharge are under-represented, which may attenuate between-phase differences.
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35 Stroke severity scales (for example NIHSS), detailed lesion classification, and activity-of-daily-living
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37 grades were not available for this secondary analysis and would strengthen future work. Severity was the
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39 recorded Mild/Moderate/Severe clinical category rather than an instrumental grade from
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41 videofluoroscopy or fiberoptic endoscopic evaluation of swallowing, and the inpatient nil-by-mouth
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43 protocol constrained intake-linked qualifiers. A multi-centre longitudinal study using the ICF-DAT
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45 alongside instrumental assessment, with patient-level environmental scoring, would test whether the
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47 group-level similarity seen here holds within patients and across settings. Articulation functions (b320)
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49 were never recorded in the source clinical dataset and could not be included in the phase comparison.
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55 56 **Conclusion**

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Assessed across body functions, activities, participation, and the environment, the burden of post-stroke dysphagia did not differ significantly between the acute and subacute phases at the group level in this cross-sectional cohort of 187 adults. The small acute-to-subacute gradient was non-significant and negligible in size, and environmental barriers were uniformly severe in both phases. Because the design is cross-sectional, this describes group-level similarity rather than within-patient recovery. These findings challenge the assumption that calendar phase alone indicates recovery; they do not prescribe staffing models. Thorough, ICF-based assessment and context-focused management remain warranted throughout the acute and subacute periods, recognising that group-level non-significance is not within-patient equivalence.

Declarations

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Figure captions

Fig. 1 Participant flow (STROBE). Of 211 consecutive stroke patients assessed for eligibility, 24 were excluded and 187 were enrolled and assessed with the ICF-DAT (74 acute, ≤ 7 days; 113 subacute, days 8–30)

Fig. 2 Acute ($n = 74$) versus subacute ($n = 113$) mean ICF qualifier scores across five core ICF-DAT qualifiers (b320 excluded — not recorded). Bars show the mean and error bars show one standard deviation. All between-phase comparisons were non-significant (all $p > 0.05$; partial $\eta^2 \leq 0.015$)

Table 1 Demographic and clinical characteristics of the cohort (N = 187)

Characteristic	n	%
Men	123	65.8
Women	64	34.2
Unspecified CVA	138	73.8
Ischaemic stroke	20	10.7
Haemorrhagic stroke	14	7.5
Non-stroke / Other	15	8.0
Acute phase (≤ 7 days post-stroke)	74	39.6
Subacute phase (days 8–30)	113	60.4

Note. Mean age 59.1 years (SD 13.7; range 20–93). The acute and subacute groups did not differ significantly in age or sex (both $p > 0.05$).

Table 2 Acute versus subacute comparison across five core ICF-DAT qualifiers

Qualifier (ICF code)	Acute ($n=74$) M (SD)	Subacute ($n=113$) M (SD)	Effect size (partial η^2)
Ingestion (b510)	1.3 (0.4)	1.3 (0.4)	0.000
Muscle tone (b735)	2.7 (0.4)	2.6 (0.5)	0.015
Speaking (d330)	2.7 (0.4)	2.6 (0.5)	0.015
Eating (d550)	2.5 (0.9)	2.2 (1.0)	0.015
Drinking (d560)	2.5 (0.9)	2.2 (1.0)	0.015
Articulation (b320)	Not recorded	Not recorded	Excluded

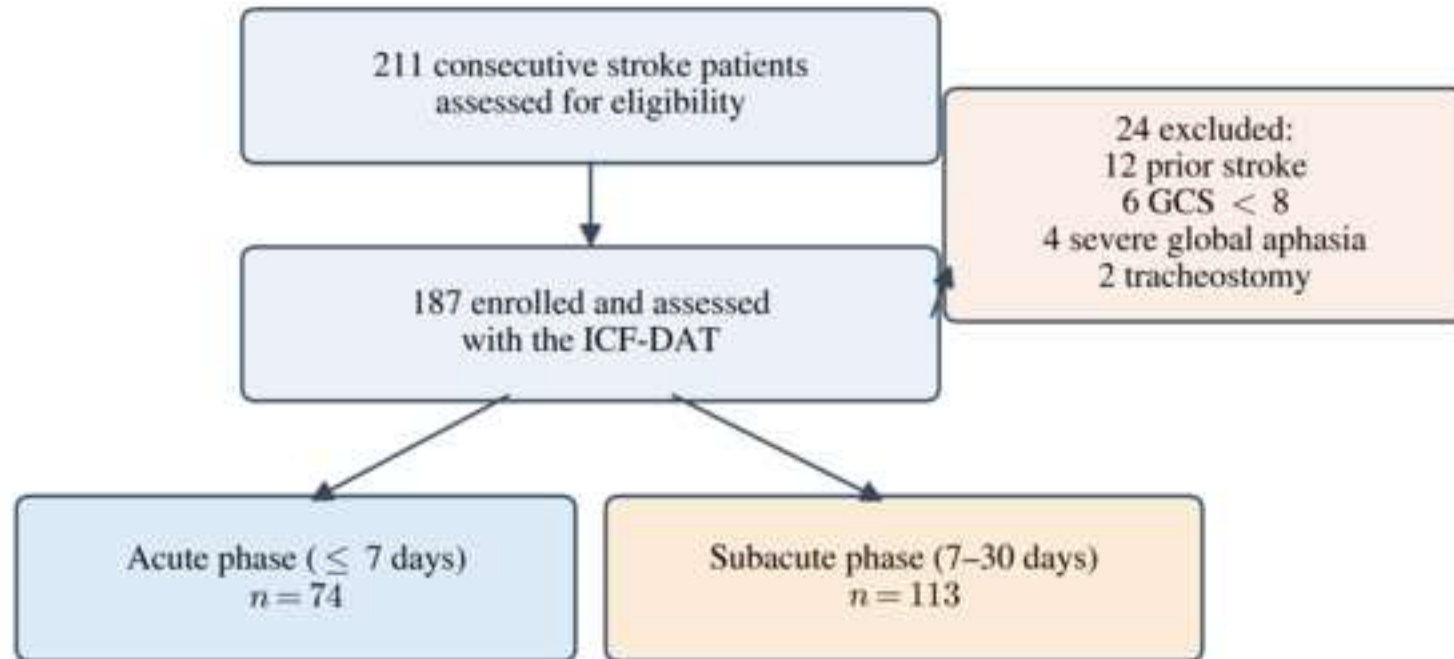
Note. Qualifier scale: 0 = no impairment to 4 = complete impairment. One-way ANOVA on $N = 187$ (74 acute / 113 subacute) from the authoritative Final_Sep2026 master chart. Exemplar: eating $F(1, 185) = 2.83$, $p = 0.094$, partial $\eta^2 = 0.015$. No comparison reached significance (all $p > 0.05$). Articulation (b320) was not recorded and is excluded. No correction for multiple comparisons was applied.

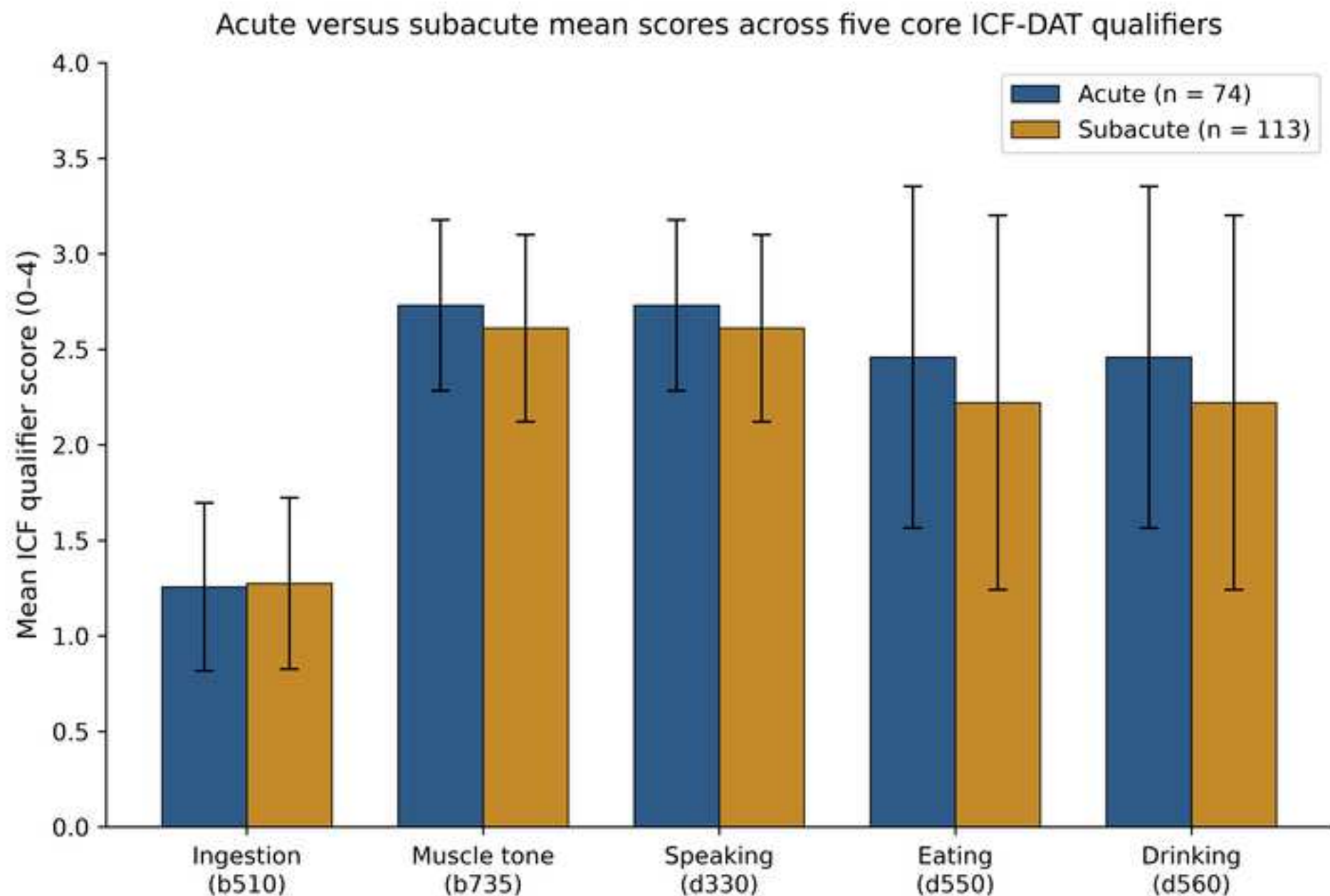
Table 3 Environmental domains rated as barriers in both phases

Environmental domain (ICF chapter)	Rating in both phases
Products and technology (e1)	Barrier
Natural environment and human-made changes (e2)	Barrier
Support and relationships (e3)	Barrier
Attitudes (e4)	Barrier
Services, systems, and policies (e5)	Barrier (most severe)

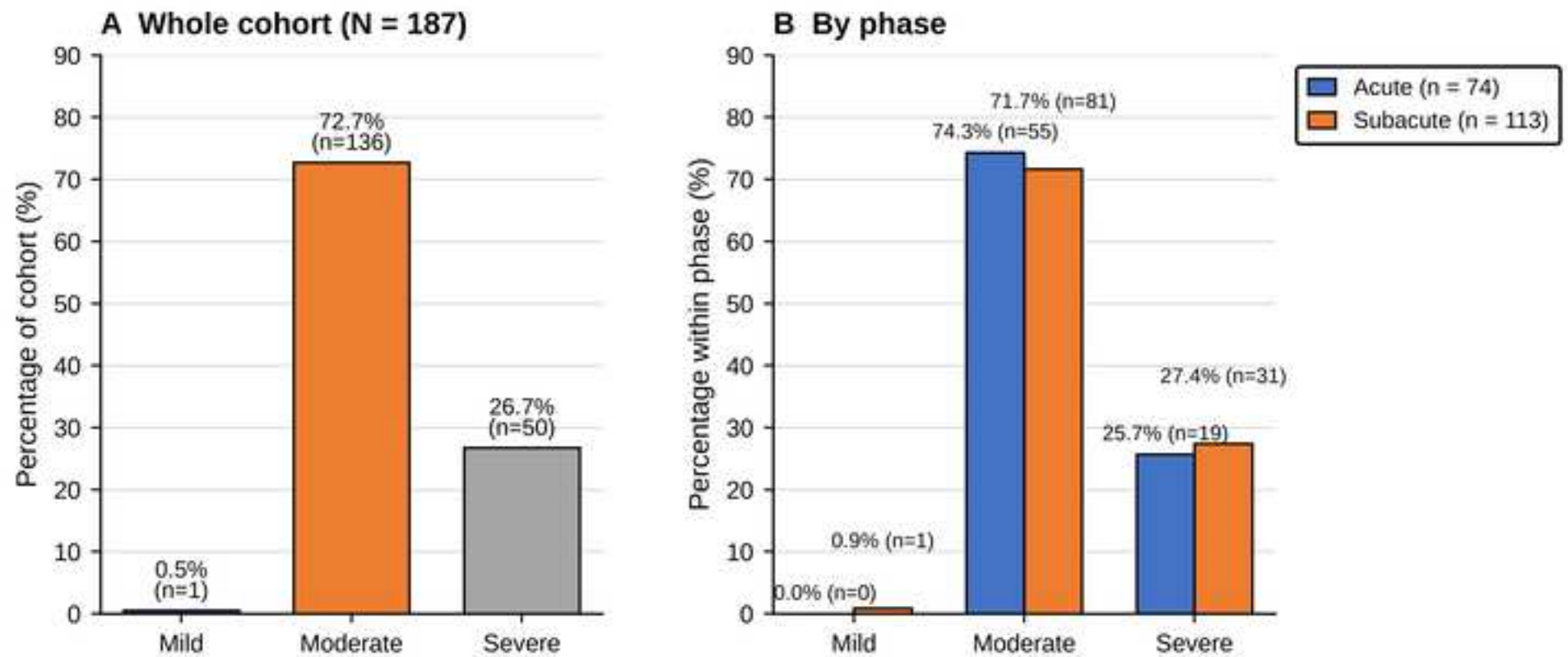
Note. All 187 patients were rated as facing barriers across all 17 environmental codes, with no variability between patients or between phases ($SD = 0.0$), reflecting service/ward-level rating of institutional barriers for the admission setting. The most severe barriers were health services, systems, and policies (e580) and health professionals (e355). The uniformity should be interpreted with caution (see Discussion).

Participant flow (STROBE)

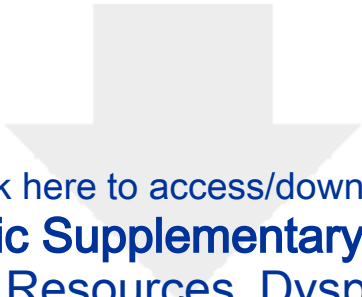




All between-phase comparisons non-significant (all $p > 0.05$; partial $\eta^2 \leq 0.015$). Error bars: SD. Articulation (b320) excluded (not recorded).

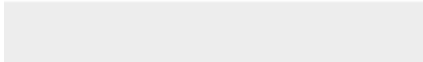


Bars show percentage; labels show % and count. Overall N=187; Acute n=74; Subacute n=113.



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