

- **Name of the study:** Assessment of Reliability and Validity of Scales for Evaluating Pediatric Swallowing.
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- **Authors:** Maya Bargil, Supervised By: Dr. Nogah Nativ Zeltzer
- **Research Authority:** Tel-Aviv University

Abstract

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Background: The Eating and Drinking Ability Classification System (EDACS), evaluates the efficiency and safety of swallowing in children with Cerebral Palsy. Although the EDACS has been shown to be reliable and valid, its criterion validity against instrumental measures such as VFSS has not yet been investigated. Additionally, the inter-rater and intra-rater reliability of VFSS rating scales have scarcely been examined in the pediatric patient population

Objectives: (1) To examine inter- and intra-rater reliability of VFSS rating scales - the Penetration–Aspiration Scale (PAS), assessing swallowing safety, and the Eisenhuber Residue Scale, assessing swallowing efficiency (2) To examine the criterion validity of EDACS in comparison with VFSS outcomes.

Methods: This retrospective study included data from 56 medical records of children aged 3–21 years who underwent clinical EDACS evaluation followed by VFSS at ALYN Pediatric and Adolescent Rehabilitation Hospital. VFSS recordings were rated by a speech-language pathologist using the PAS and Eisenhuber Residue Scale for the most severe swallow observed for solids and liquids. Inter-rater reliability was assessed in 40% of the studies randomly rated by a second clinician, intra-rater reliability was examined in 57% of the studies re-rated after one month. Criterion validity of the EDACS was examined relative to PAS and Eisenhuber scores.

Results: The PAS showed high inter-rater reliability (*Average ICC* = 0.875, κ = 0.777). Intra-rater reliability was moderate-to-high, with high consistency for liquids (r = .859, p < .001) and

solids ($r = .844$, $p < .001$). No significant difference was found between test–retest PAS liquid scores ($p = .295$), whereas a borderline change was observed for solids ($p = .054$). The Eisenhuber Residue Scale demonstrated low inter-rater reliability ($ICC = 0.30–0.46$, $\kappa \approx 0.30$); following a consensus procedure between raters, high reliability was obtained for residue in the pyriform sinuses ($ICC = .796$) and vallecula ($ICC = .802$). Intra-rater reliability for residue measures was moderate-to-high, with significant correlations for most indices ($r = .51–.97$, $p < .05$) and no significant mean differences ($p > 0.05$). EDACS showed a weak-to-moderate positive association with PAS and no significant association with Eisenhuber residue scores. Approximately half of the children classified as EDACS level 3 demonstrated silent aspiration.

Conclusions: PAS is a reliable tool for use in pediatric VFSS. The Eisenhuber Residue Scale requires further standardization for pediatric use. EDACS demonstrated limited criterion validity relative to PAS and should not be used as a standalone tool for swallowing safety assessment.

Keywords

Pediatric Dysphagia, Videofluoroscopic Swallowing Study (VFSS), EDACS, PAS, Eisenhuber Residue Scale, Cerebral Palsy.

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