

Feasibility of Developing an Algorithm to Derive Ratings of Social Communication Functioning (ACSF:SC) from ADOS Data

Stephen J. Gentles^a, Briano DiRezze^a, Peter Rosenbaum^a, Lonnie Zwaigenbaum^{b,d}, Mary Jo Cooley Hidecker^d, Stelios Georgiades^e, Eric Duku^e

^a CanChild, and School of Rehabilitation Science, McMaster University, Hamilton, Ontario; ^b Glenrose Rehabilitation Hospital, Edmonton, Alberta; ^c Department of Pediatrics, University of Alberta, Edmonton, Alberta; ^d Augmentative and Alternative Communication, Audiology, Epidemiology, and Severe Disabilities, University of Wyoming, Laramie, Wyoming; ^e Offord Centre for Child Studies, and Department of Psychiatry and Behavioural Neurosciences, McMaster University, Hamilton, Ontario, Canada

Background

The ACSF:SC (Preschool Age)

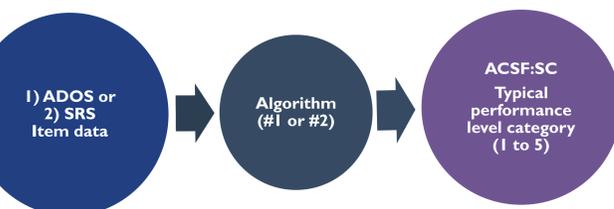
Modeled on the internationally recognized Gross Motor Function Classification System for cerebral palsy¹, our group developed and validated the Autism Classification System of Functioning: Social Communication (ACSF:SC).² Based on WHO's International Classification of Functioning, Disability, and Health framework (ICF)³, the ACSF:SC allows either parents or familiar professionals to categorize children aged 3-5 into one of 5 levels of **social communication functioning**.

Why are we doing this work?

It may be possible to extract descriptive levels of social communication functioning from standardized tools routinely used in ASD assessment and research, such as the ADOS⁴ or SRS-2⁵. The ability to derive valid ACSF:SC estimates from such measures would increase the available data for research purposes. Notably, such estimates derived from retrospective data could facilitate examining longitudinal trajectories of social communication functioning in ASD.

What does this poster show?

We present our methods and preliminary pilot results showing the feasibility of developing and validating two algorithms for deriving ACSF:SC ratings from 1) ADOS data and 2) SRS data, respectively.



Methods & Pilot Results

Methodological Steps	#1) ADOS	#2) SRS
a) Item selection	Delphi process: 14 items	Communication subscale: 22 items
b) Algorithm development	(see Future Plans)	Preliminary CART
c) Algorithm validation	(see Future Plans)	(see Future Plans)

a) Item selection

ADOS items: Delphi

To select ADOS items relevant to the ACSF:SC construct of social communication for use in developing algorithm #1, we conducted a modified Delphi in which 6 team members rated ADOS items on how informative their response options were for discriminating between ACSF:SC levels. After 3 rounds of voting on items from Modules 1 and 2, consensus was reached on including the following items (80% agreement criterion):

Module 1	Module 2
Frequency of vocalization	Amount of social communication
Use of others' body to communicate	Conversation
Pointing	Pointing
Gestures	Gestures
Responsive social smile	Facial expressions directed to others
Facial expressions directed to others	Response to name
Integration of gaze and other behaviors	Showing
Response to name	Initiation of joint attention
Requesting	Response to joint attention
Giving	Quality of social overtures
Showing	Quality of social response
Initiation of joint attention	Amount reciprocal social communication
Response to joint attention	Overall quality of rapport
Quality of social overtures	

SRS items: Communication subscale

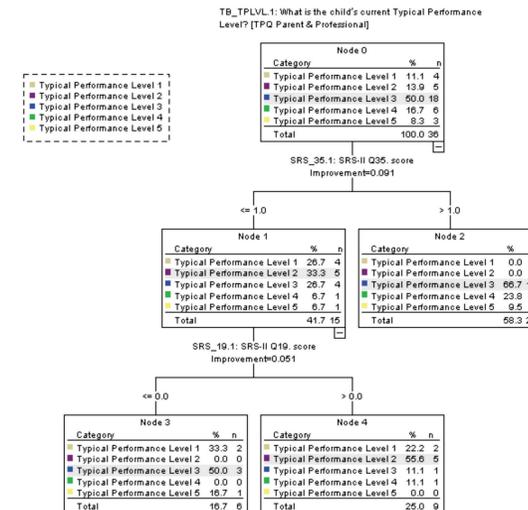
For the SRS-2 (Preschool), relevant items are grouped within the Communication subscale of the instrument (22 items).

b) Algorithm development

Classification and Regression Trees (CART) analysis⁶ was chosen to develop and validate both the ADOS and SRS algorithms. CART requires a large enough sample of paired data (i.e., ADOS or SRS assessments and ACSF:SC ratings in the same child).

SRS: Preliminary CART algorithm

Using paired SRS and ACSF:SC assessments available from the original ACSF:SC validation dataset² (n=36), we performed a pilot CART analysis (SPSS; below).



Data were split on only 2 of 22 items—since sample size was insufficient to develop an extensive tree. Nevertheless the first-level predictor, item #35 (*Has trouble keeping up with the flow of normal interaction with other children*), also had the only significant association in crosstabs analysis, suggesting it is importantly predictive of ACSF:SC level.

Conclusions

These pilot results indicate that a substantially larger paired dataset is necessary to develop a reliably predictive tree (algorithm) and have sufficient data left to validate it—for both SRS and ADOS algorithms.

The methodology established here has value as a template for developing additional algorithmic means for deriving ICF-based ratings of functioning in ASD (not limited to social communication) from routinely available data generated by commonly used instruments—extending opportunities for secondary data analysis.

Future Plans

To fully develop and validate ADOS and SRS algorithms, we have planned prospective collection of anonymized ADOS and SRS assessment data with paired ACSF:SC ratings through clinical and research partners who have agreed to administer the minimally burdensome ACSF:SC alongside these standard assessment tools.

References

- Wood, E., & Rosenbaum, P. (2000). The Gross Motor Function Classification System for Cerebral Palsy: A study of reliability and stability over time. *Developmental Medicine and Child Neurology*, 42, 292-96.
- Di Rezze, B., Rosenbaum, P., Zwaigenbaum, L., Hidecker, M. J., Stratford, P., Cousins, M., Camden, C., & Law, M. Developing a classification system of social communication functioning of preschool children with autism spectrum disorder. *Developmental Medicine & Child Neurology* (in press).
- World Health Organization. International Classification of Functioning, Disability and Health (ICF). World Health Organization, Geneva, Switzerland (2001).
- Lord, C., Rutter, M., DiLavore, P. C., & Risi, S. (2002). *Autism Diagnostic Observation Schedule-WPS (ADOS-WPS)*. Los Angeles, CA: Western Psychological Services.
- Constantino, J. N. (2012). *The Social Responsiveness Scale, Second Edition*. Los Angeles, CA: Western Psychological Services.
- Breiman, L., Friedman, J. H., Olshen, R. A., Stone, C. J. (1984). *Classification and regression trees*. New York: Chapman & Hall.