The Unified Batten Disease Rating Scale (UBDRS): Validation and Reliability in an Independent Sample

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Introduction

The Neuronal Ceroid Lipofusinoses (NCLs) comprise more than 10 different rare, inherited, fatal lysosomal diseases of childhood. Juvenile Batten Disease, due to mutations in *CLN3*, is characterized by progressive vision loss, epilepsy, dementia, behavioral difficulties, and motor impairment.

The Unified Batten Disease Rating Scale (UBDRS) is a disease-specific rating scale that was developed to assess disease severity in 4 domains: physical, behavior, seizures, and functional capability. Validity and reliability of the UBDRS has been established in a large North American CLN3 disease cohort.

Objectives

To determine whether the UBDRS is valid and reliable in an independent sample of individuals with CLN3 disease.

Methods

- Participants with genetically confirmed CLN3 disease were recruited through the NCL clinic at University Medical Center Hamburg Eppendorf (UKE) in Hamburg, Germany.
- The trainer (JM) is a co-developer of the UBDRS and has used it in over 300 evaluations of individuals with CLN3 disease. Independent raters consisted of one pediatric neurologist (AS) and 3 pediatricians experience in the care of NCL patients (MN, EW, CS).
- Each item of the UBDRS was explained by the trainer. 3 participants were evaluated by the trainer with the independent raters watching and independently scoring. 10 participants were evaluated by one of the independent evaluators with the others watching and generating scores independently.
- Inter-rater reliability for the physical subscale was assessed with intraclass correlation coefficients (ICC).
- Validity of the UBDRS physical subscale in this independent sample was assessed by comparison with previously published results.

Subjects

- **13 individuals with genetically confirmed CLN3 disease and juvenile onset symptoms**
- **6 Male 7 Female**
- **Age at time of evaluation**
  - **Mean 16.5 yrs**
  - **SD 5.6 yrs**
  - **Range 9.5 – 23.2 yrs**
- **Severity on Physical Subscale (scale range 0 – 112)**
  - **Mean 28**
  - **SD 21**
  - **Range 1 – 61**

UBDRS Physical Subscale Scores by Subject and Rater

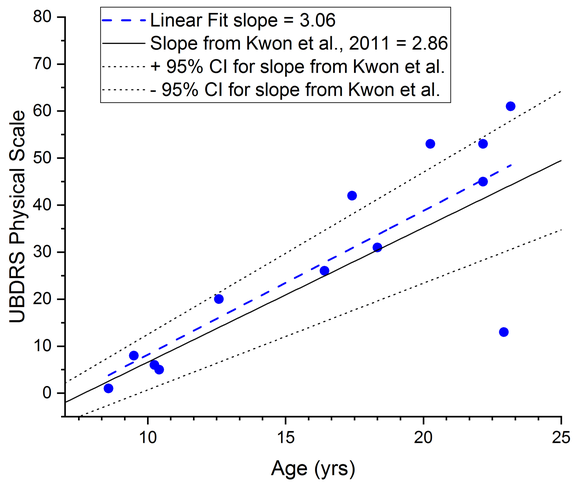
Subject #	Evaluator				
	Trainer	A	B	C	D
1	6	8	5	5	8
2	45	48	46	47	42
3	53	54	54	53	55
4	1	1	1	1	1
5	53	52	54	53	56
6	31	33	34	32	30
7	61	61	61	61	58
8	42	44	44	44	38
9	20	19	19	17	21
10	13	13	11	9	16
11	5	6	3	3	8
12	26	28	26	26	30
13	8	8	8	8	10

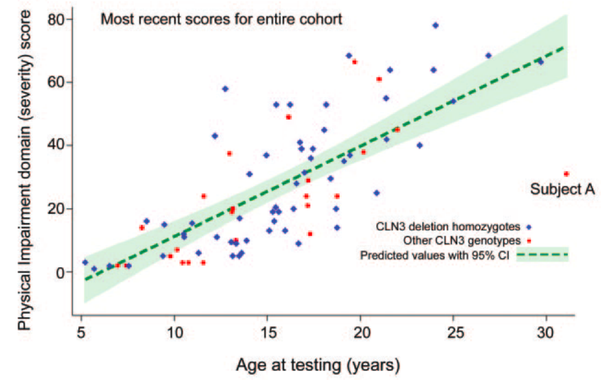
ICC Analysis Demonstrated Excellent Inter-Rater Reliability

- **ICC for all 5 raters = 0.92**
- **Agreement between each rater and the trainer was > 0.98**

A	B	C	D
0.99	0.99	0.99	0.98

UBDRS Physical Subscale Rate of Change is Similar Across Samples





Top Graph: Data from Current Study
Bottom Graph: Data from Kwon et al., 2011 (N=82)

Conclusions

- The UBDRS Physical Subscale has excellent inter-rater reliability when performed by trained raters
- The relationship between severity and age in this independent German sample (N=13) is comparable to the the relationship previously reported in a large North American sample (N=82).
- The excellent inter-rater reliability and validation in an independent sample indicates that the UBDRS can used by trained raters to assess the severity and rate of progression of CLN3 disease.

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