Developing an assessment tool of generic skills for students with intellectual disability

8th December, 2021 16:15-16:50

特殊學習需要與融合教育中心
Centre for Special Educational Needs and Inclusive Education

Generic skills

- Generic skills are the core life skills that are proposed by the World Health Organization.
- Basic skills an employee looks for include:
- Collaboration, communication, problem solving, critical thinking, self-management and information technology.
- Successful development of generic skills requires:
- An unbiased reception, and interpretation of the noisy information from the environment from all different sensory modalities, including vision, touch and audition (Ernst, 2012:527).
- For individuals with intellectual disability, the goal of generic skills development is to attain an optimal solution to multi-sensory integration such that a reliable estimate of ”reality” might be arrived and sensible decision made (Cochran, 1937).

Our aim is to develop a statistically optimal solution for generic skills development using virtual reality learning (VRL) and adventure-based learning (ABL).

We believe that

- Optimal learning occurs in response to environmental demands (Miller et al., 2012:710);
- Also, active participation in novel tasks within an enriched multisensory environment promotes plasticity (Miller et al., 2012: 710);
- The child must act on an objective task in the environment first by receiving and adequately processing information and then producing an appropriate response to the challenge (Miller et al., 2012: 710);
- Our aim is to help students with intellectual disability to generalize what is learnt to everyday life situation by eliciting adaptive responses (Parham & Mailoux, 2005).

Context

- The project incorporated the combined effort of the University, ID schools and NGO.
- It seeks to implement a pedagogy that is more experiential based.
- Where HKCS and the principals formed a community of practice exploring best matched strategies, the university led the evaluation part.
- Training was then provided by HKCS and EDUHK.
- We see a new tripod relationship between the university, the NGO as well as the special schools.
- This helps lessen the complexity in implementation and also support dynamic trials which might not be at all compatible with existing practice.
- On the user level, we value both large scale analysis as well as individual case study.

Successful Implementation requires practice change

- A shift from representing generic skills as a skill-based construct to one that is more cognitive oriented.
- By recoding items according to a cognitive paradigm, a higher differentiating power up to 85% was attained.
- Fuzzy area that mixed level performance of the mild, moderate and severe IDs reduced from around 40% to 15%.
- We shall illustrate this by focusing on the measurement of cognition and social cognition capacity.

Hypothesis

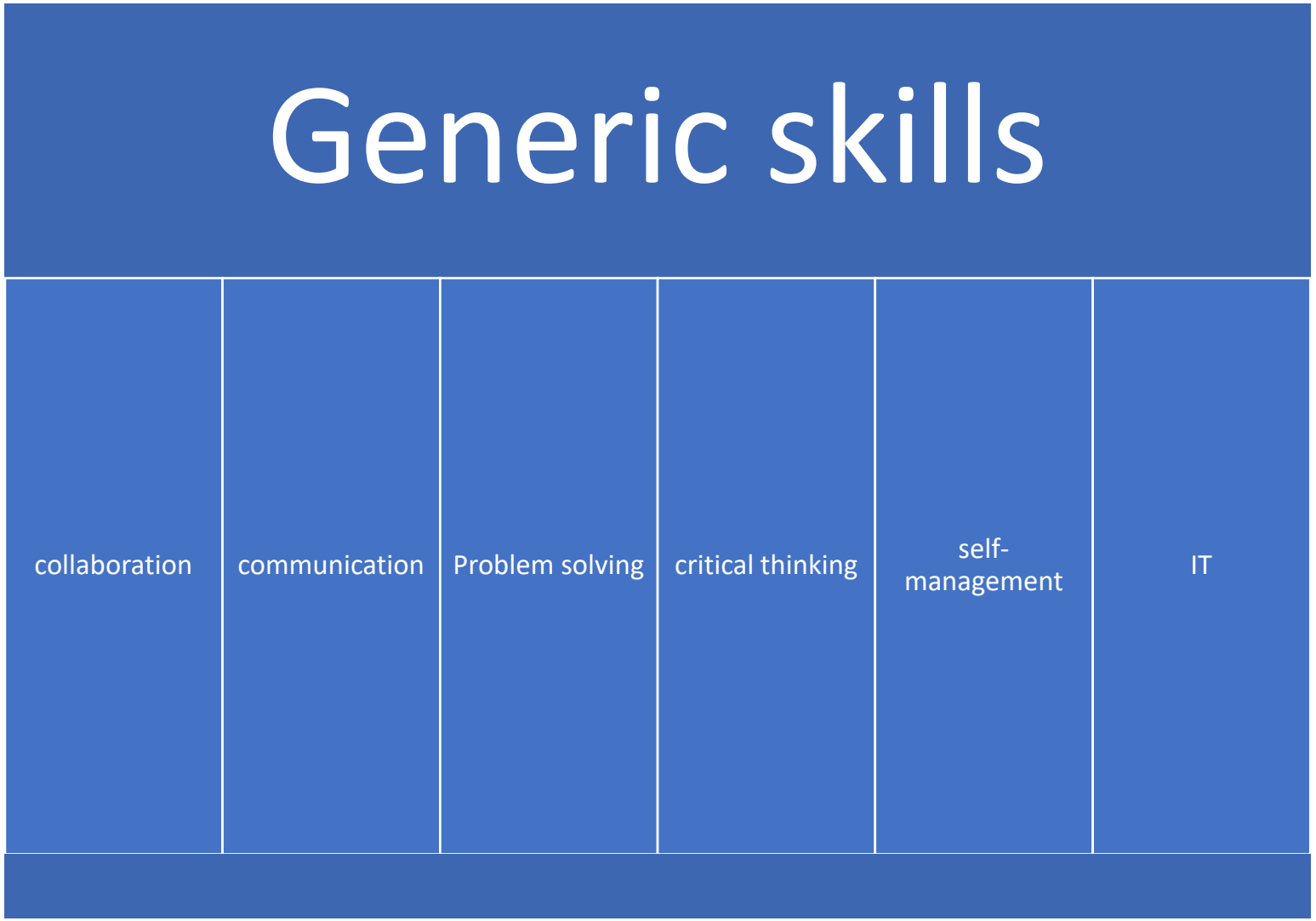
- By remediating the underlying sensory impairments, higher level processing (e.g. cognition and/or social cognition) will also improve.

Study design

- Pre-test & Post test data were collected (P, T1, T2 & T3)
- Cohort study over three years in six ID schools, four adult centers and 10 satellite schools as well as seven partner satellite adult centres in year two and three

screening tool

The screening tool includes more than 300 items on six generic skills domains.



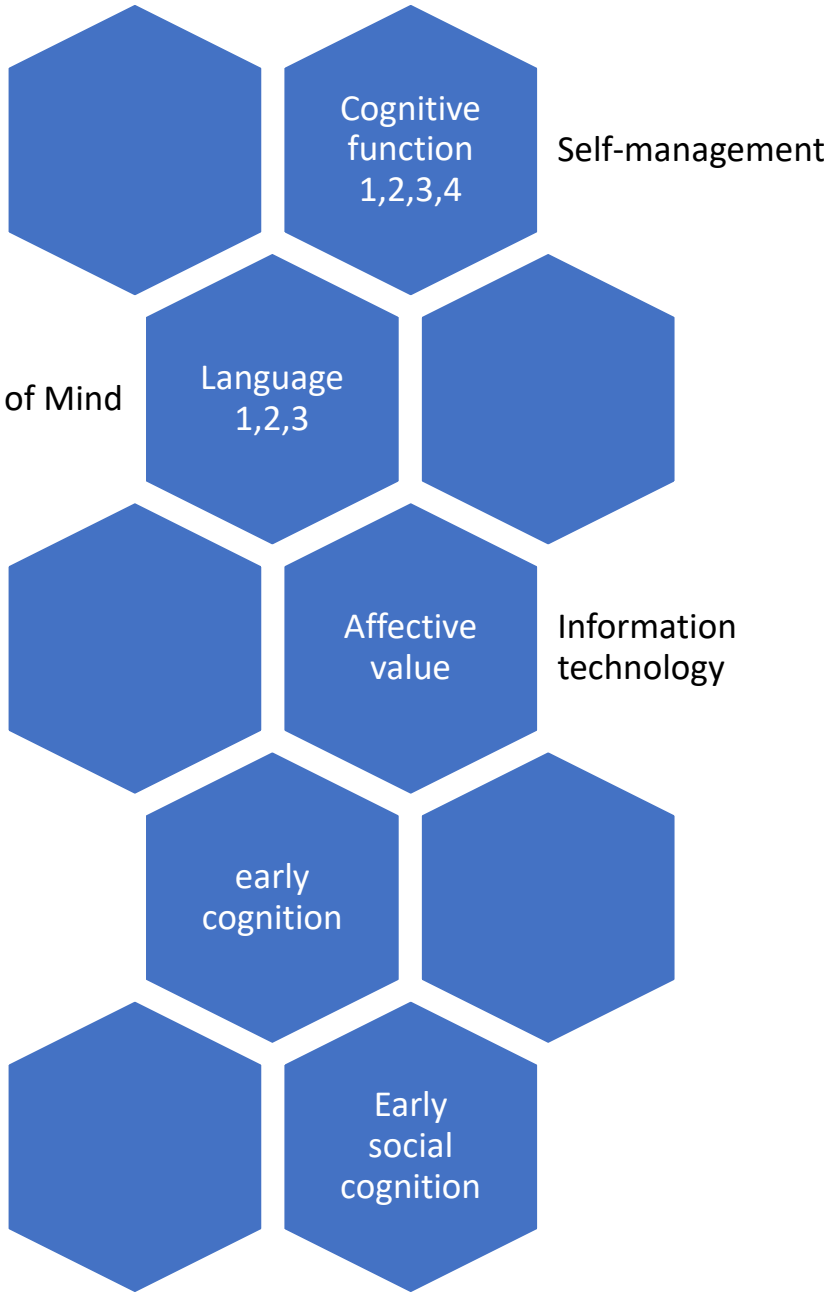
New modelling

Statistical modelling

using correlational weight to adjust the impact of cognition and social cognition on the performance of self-management.

Steps	Content
1	Item selection
2	Test whether individual component skills were multi-dimensional in nature
3	Identify outliers and Test model fit
4	Model assumption
5	Setting the upper and lower boundary of the fuzzy area (Wang et al., 2017, "Learning with uncertainty")
6	Briggs and Wilson, M. (2003) Briggs & Wilson (2003) used the sum of squares indicator (DI). DI reports the examinees' corresponding standardized dimensional ability estimates in logit values. $DI_p = \sum_{d=1}^{6} \left(\overline{\theta} - \theta_d \right)^2$
7	Two different models: a) Anchoring on population mean on individual generic skills basis allows one to detect perceptual integration capacity; b) Anchoring on the individual's adaptive function allows one to detect perceptual bias.
8	Adding correlational scores as a weight best summarize the effect size of intervention studies
9	Identify person measure order on the Rasch person map
10	Identify developmental gap (Trevor Bond, 2020, fourth edition, "Applying the Rasch model: Fundamental measurement in human science"))
11	Based on this a ToM related cognitive-linguistic construct was developed including variables like Attention control, emotive ToM, Observe social rule, Curiosity, Theory of

New modelling



Statistical modelling

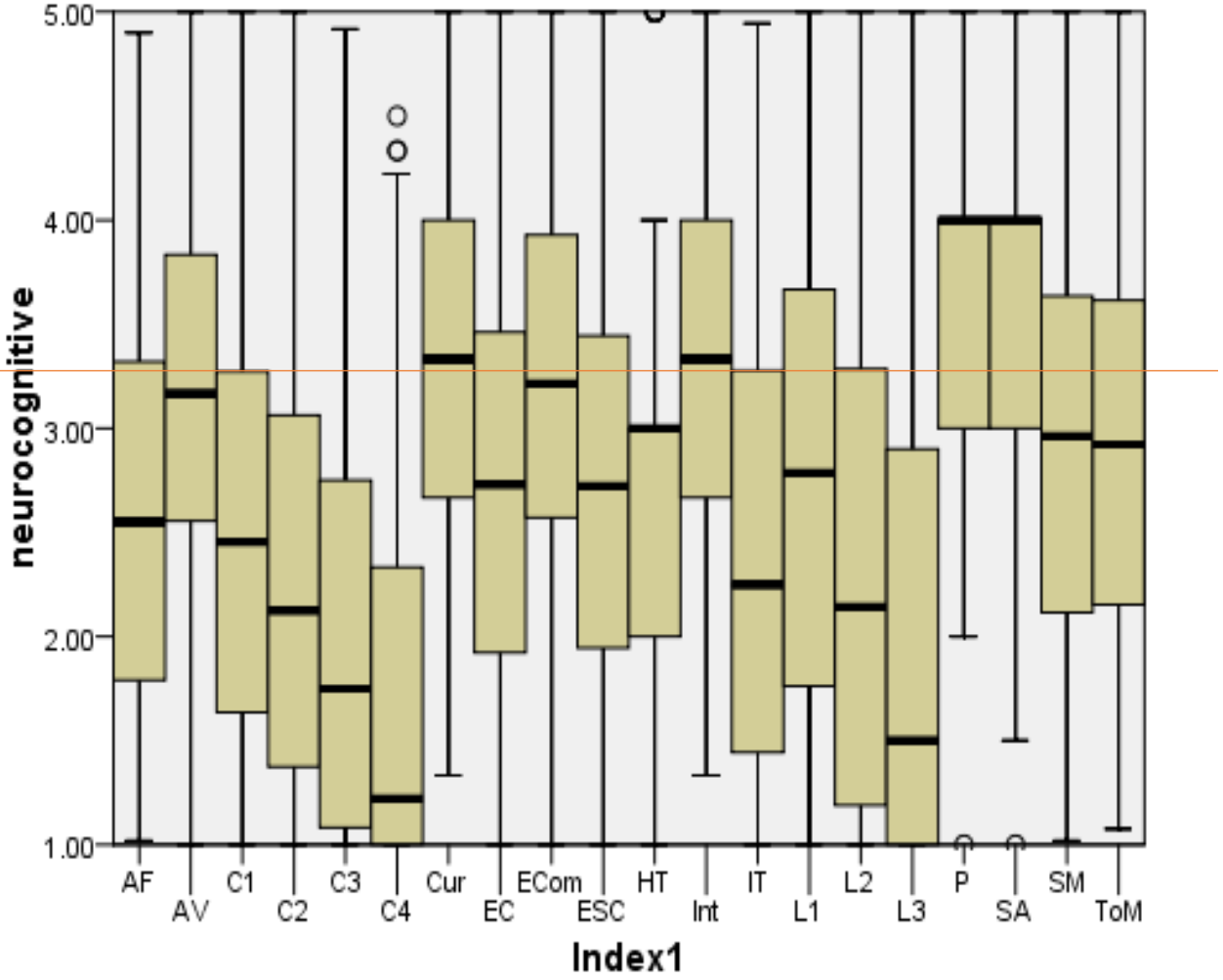
using correlational weight to adjust the impact of cognition and social cognition on the performance of self-management.

Clustering of new latent variables

1. Some latent variables might be developmental in nature (e.g. C1-C4; L1-L4);

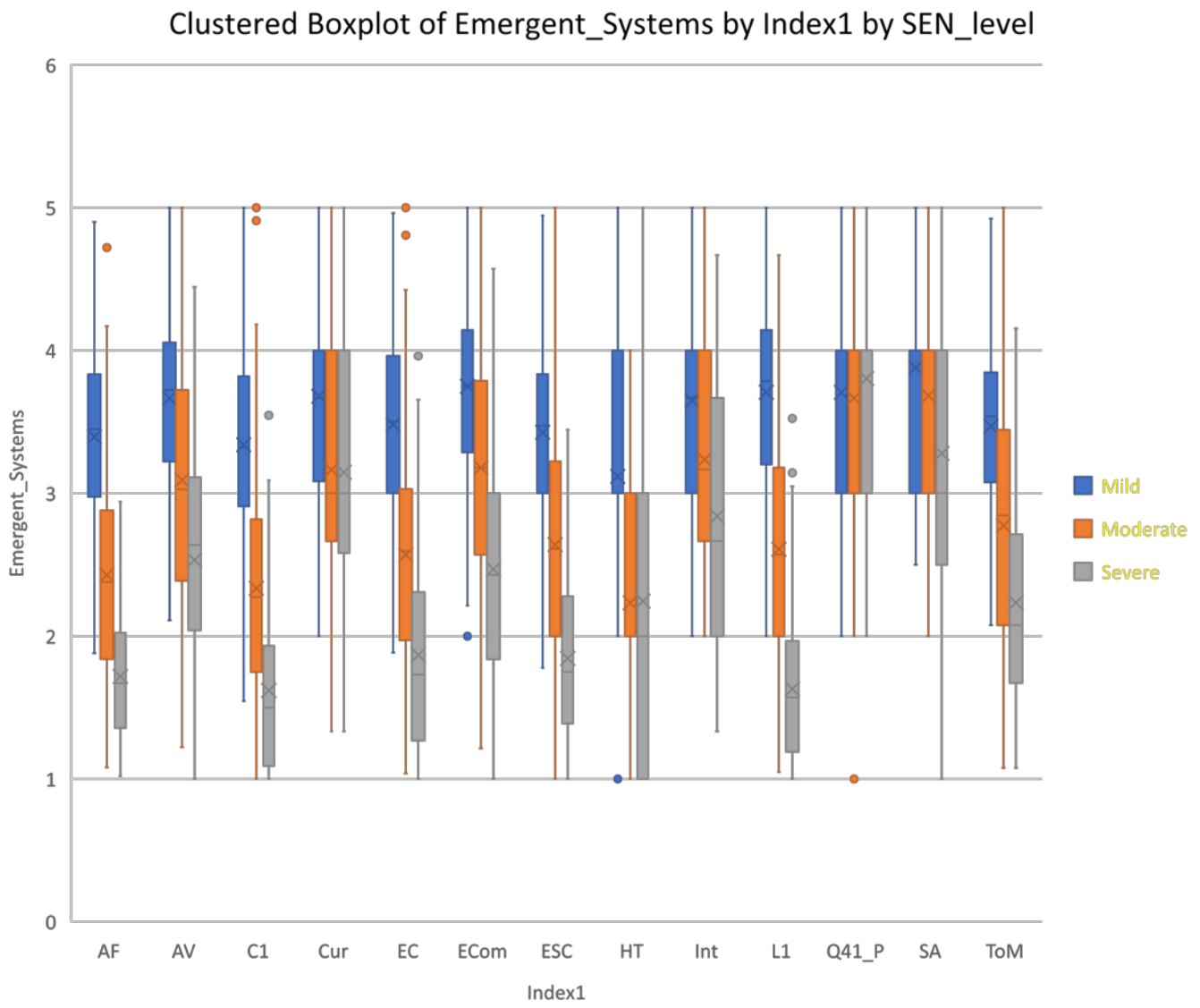
2. Some variables have higher value than that of AF (e.g. AV, Cur, ESC, Int, L1, P, SA and ToM). They formed the emergent system for later development.

AF = adaptive function;
AV = affective value;
C = cognition;
Cur = curiosity;
EC = emergent cognition;
ECom = emergent communication;
ESC = Early social cognition;
HT = Hypothesis testing (Later recoded as active repetition);
Int = introversion;
L = language;
P = perception;
SA = Supported action;
SM = self-management;
ToM = Theory of Mind

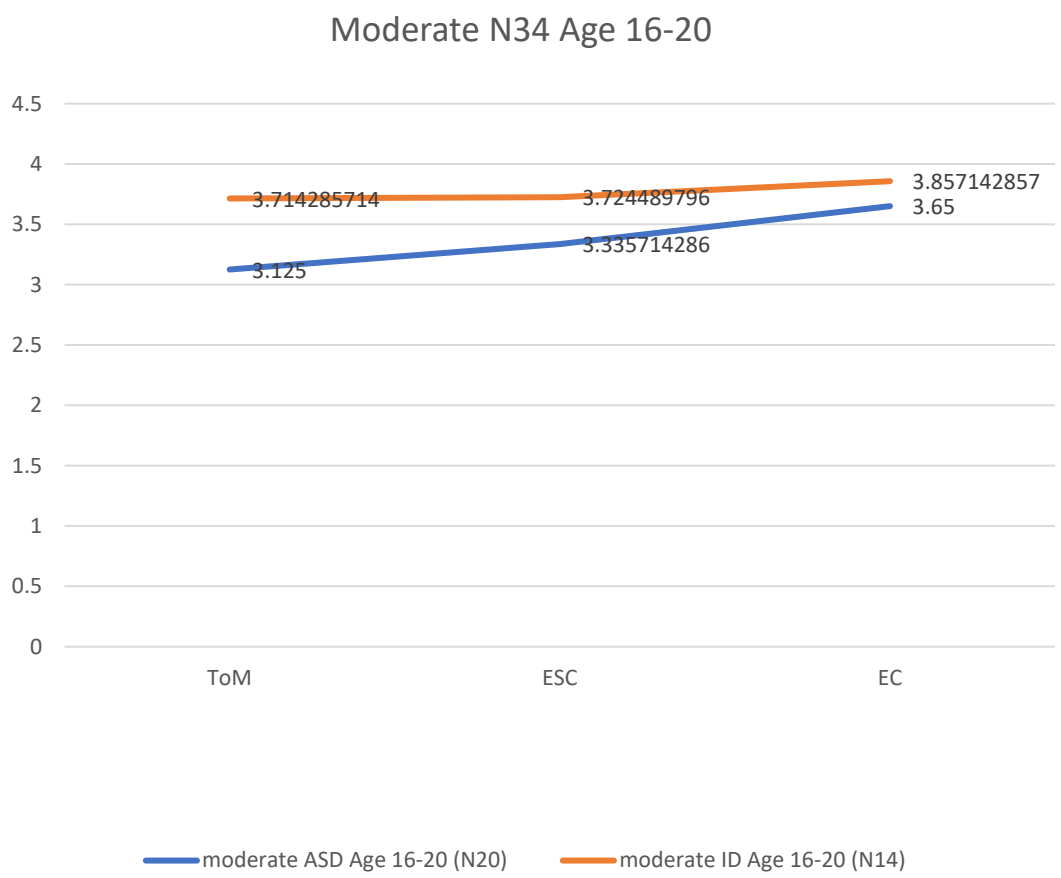


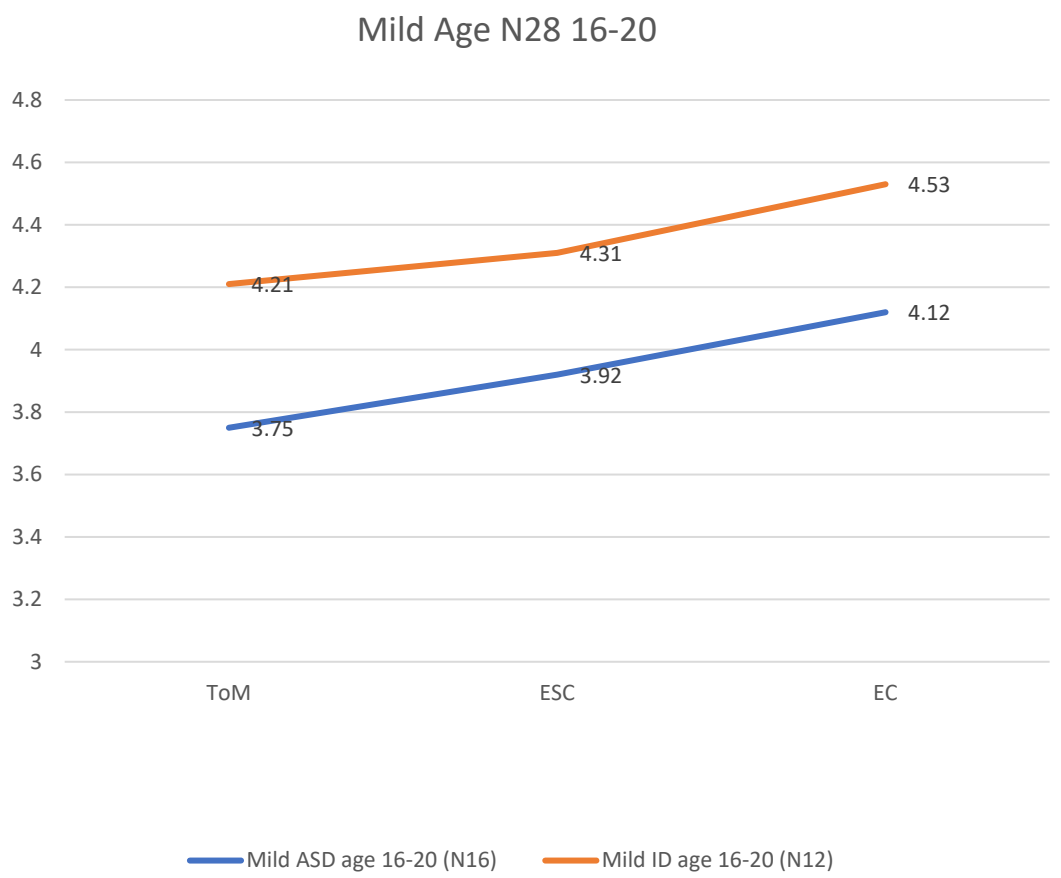
Clustered boxplot of the new measures by SEN levels

Based on the current classifiers of SEN levels, overlapping areas were observed, suggesting that there is a chance that the current classification of SEN levels might not be sensitive and/or specific enough in classifying students' adaptive function.



Where fuzziness lies

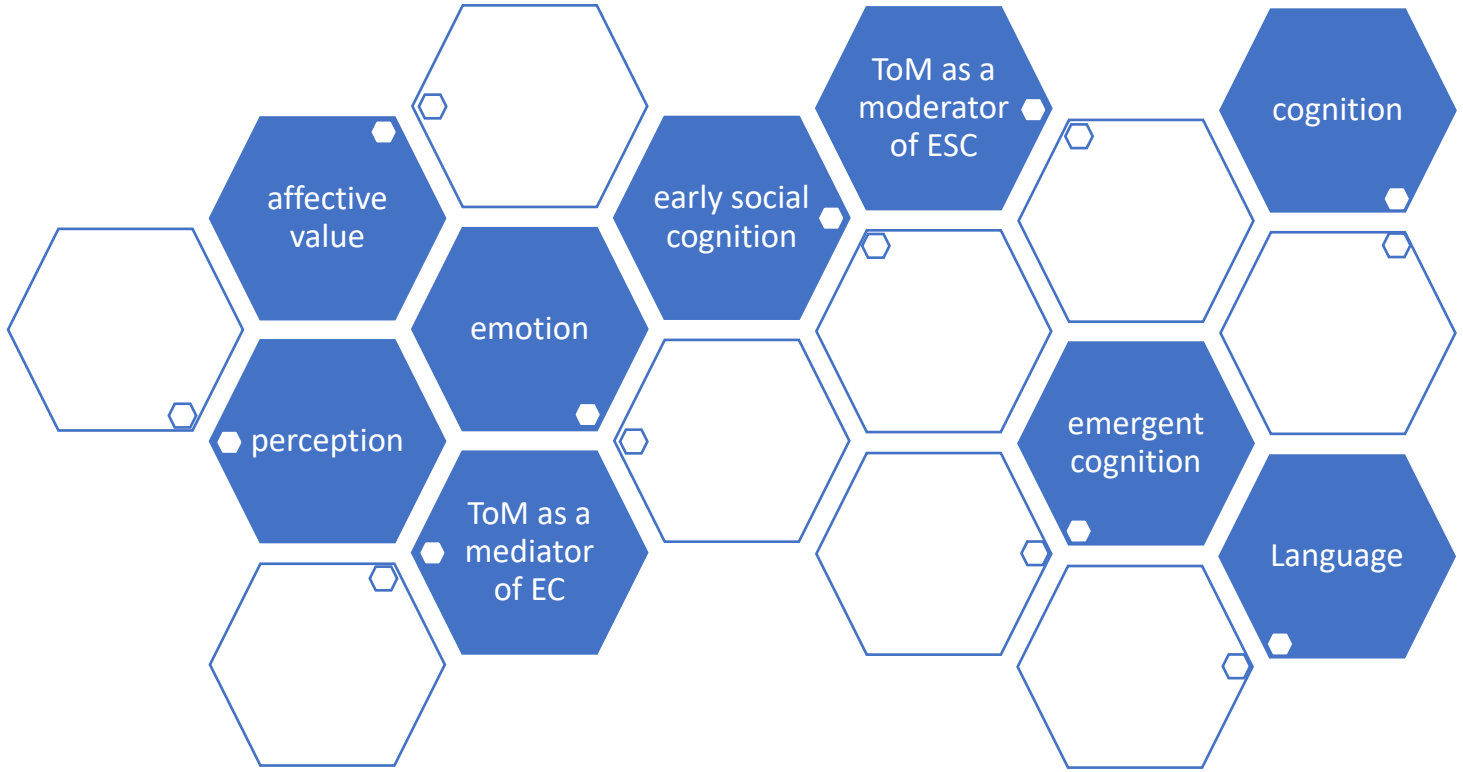




A developmental model of cognitive function

Based on our mediation and moderation analysis, a developmental pathway in cognition and social cognition was construed.

By anchoring on specific developmental stages for correlational weight adjustment, we were able to differentiate 99% of students into different developmental stages in terms of cognition and social cognition.

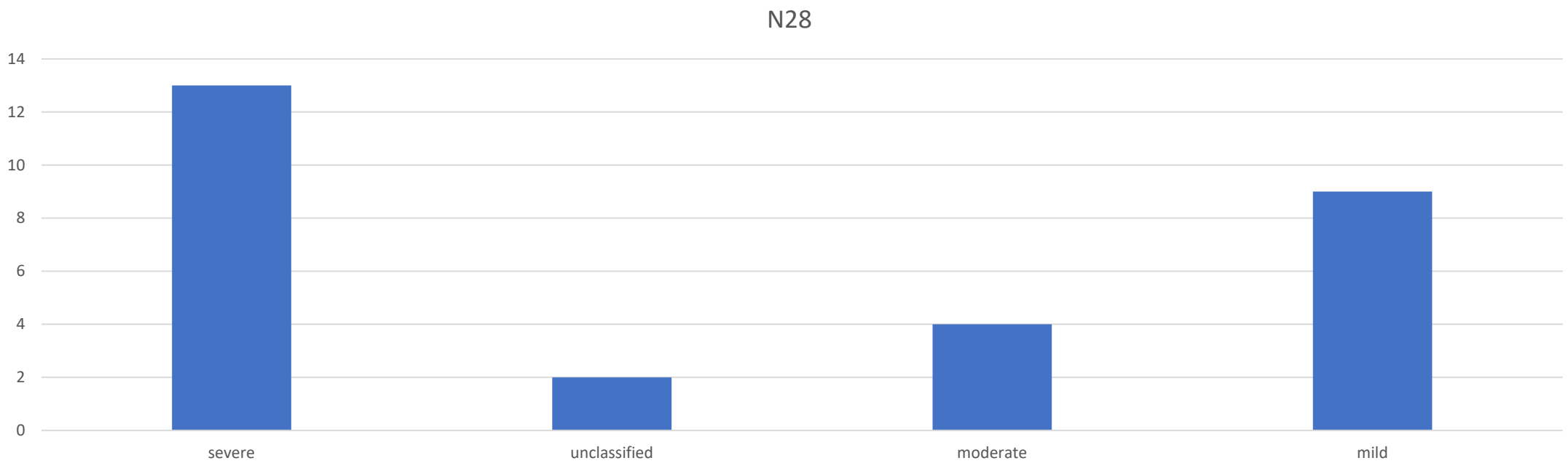


Evidencing the new cognitive construct using the growth analysis of ABL and VRL

P (Jul, 2019);

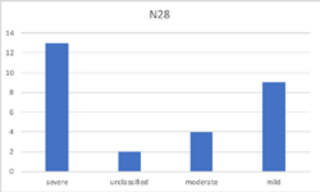
T1 (Nov, 2019);

T2 (Nov. 2020).

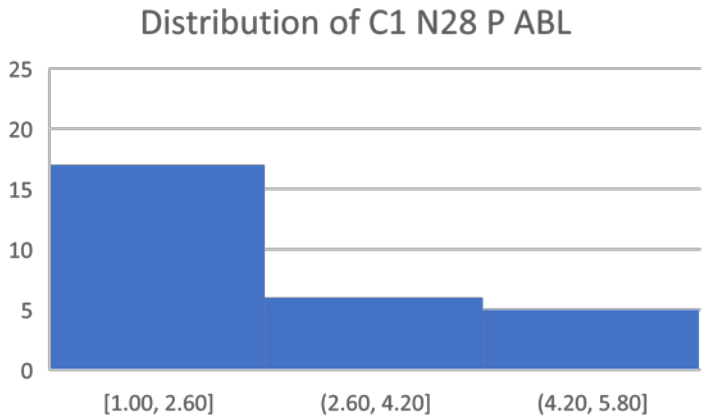


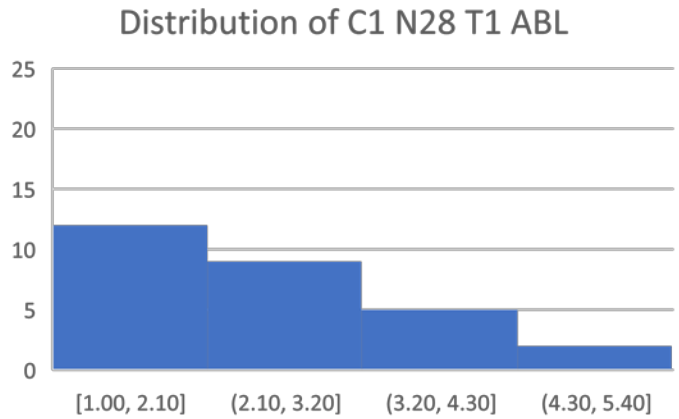
Fuzziness of classification

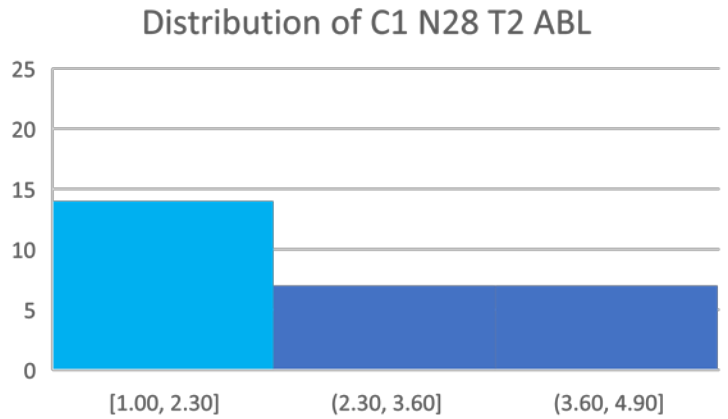
Purely looking at the student demographic of our lining samples (N28), we would expected to see higher frequency of high and low performers in the skills being assessed in terms of the measurement of cognition and social cognition. However, this was not always the case.



Growth in cognitive skills after ABL intervention







C1 in P N28

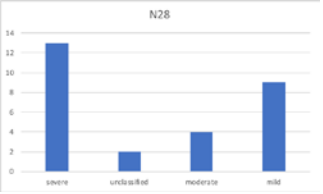
No significant difference in cognition between the moderates and the mild iDs was observed in the pilot test.

C1 in T1 N28

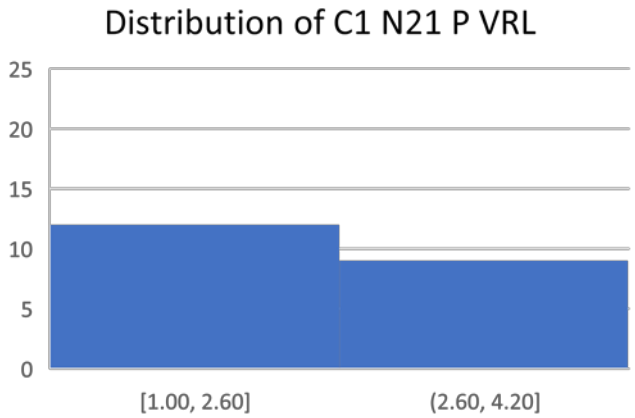
Finer dispersion of level clusters and improved Cognition in mid-level performers, which might suggest different pace of responsive act to intervention.

C1 in t2 N28

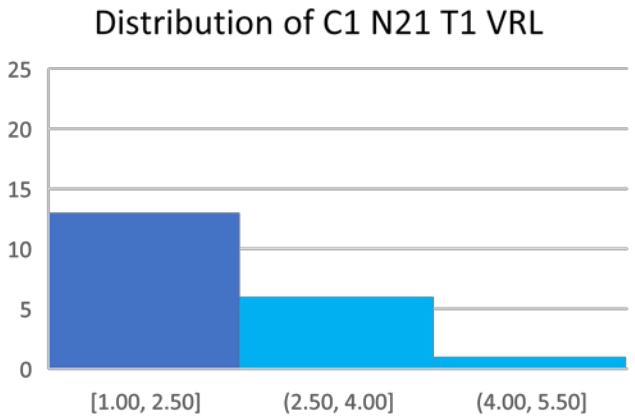
In T2, A continuous uniform distribution between the moderates and the mild IDs was observed with reduced severe performance in Cognition.



Growth in cognitive skills after VRL intervention

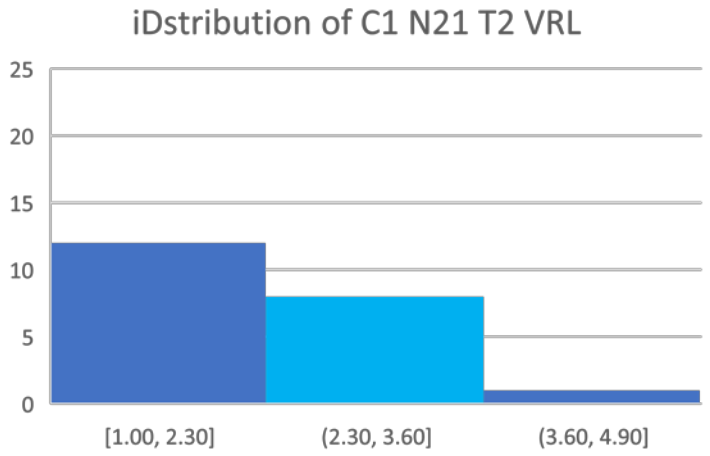


C1 in P N21



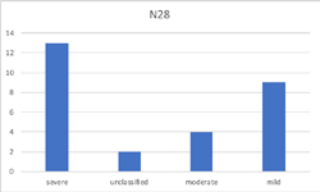
C1 in T1 N20

One more cluster emerged in T1 & T2, suggesting different pace in capacity building across different ID sub-groups.

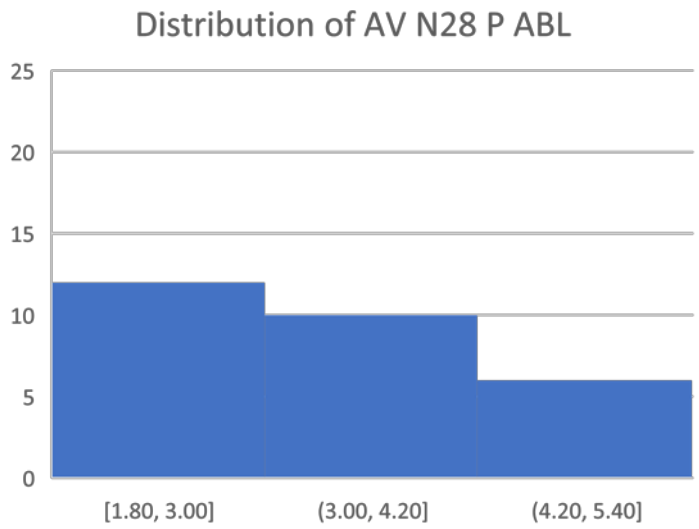


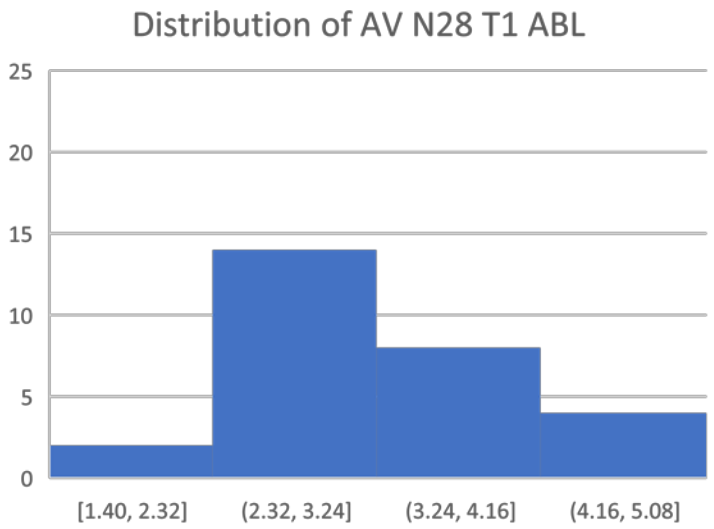
C1 in T2 N21

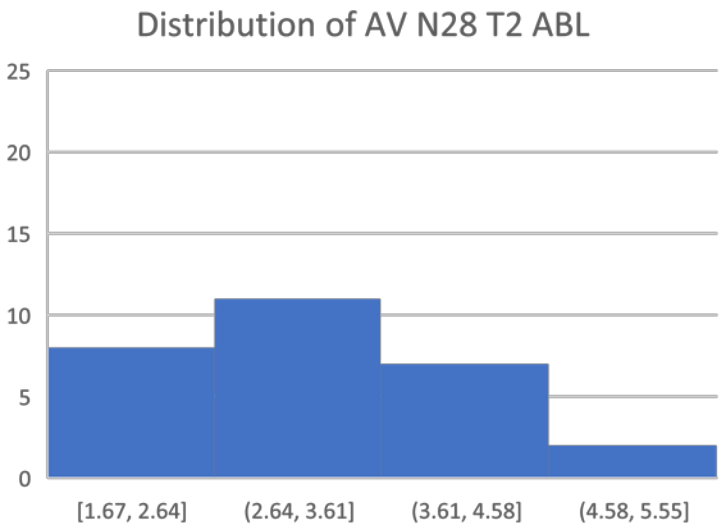
Number of mid-level performers increased



Growth in affective value







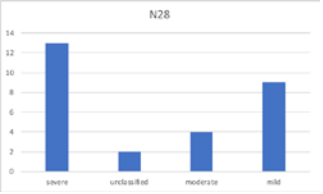
AV in p N28

Av in t1 N28

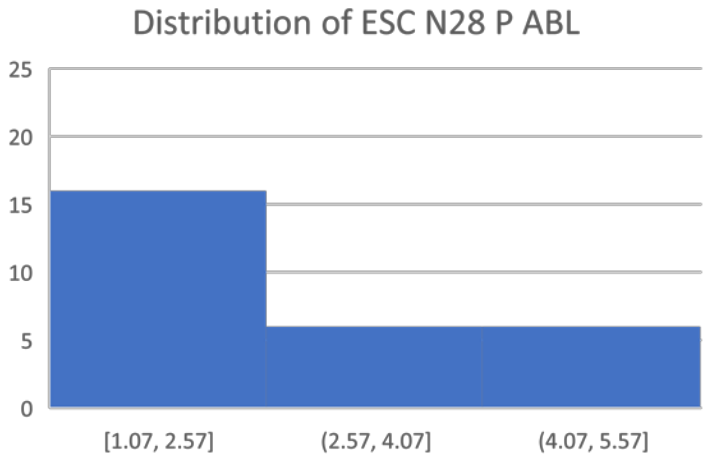
Finer dispersion of capacity in AV was observed in T1 suggesting different rate of responsive act towards the. intervention.

Av in t2 N28

such a developmental trend approached a normal distribution in T2.

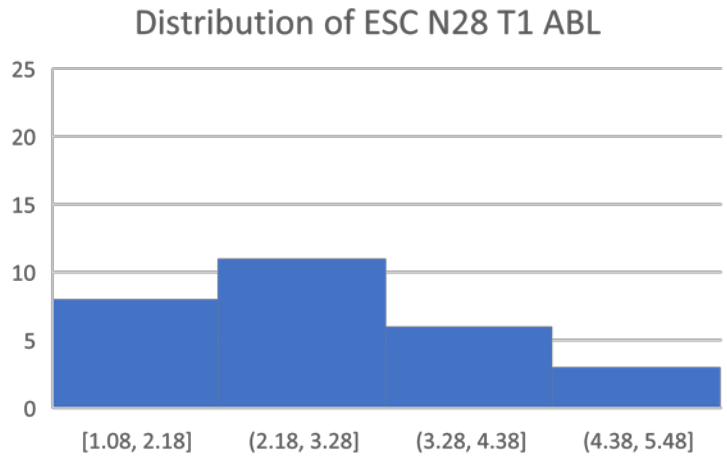


Growth in early social cognition



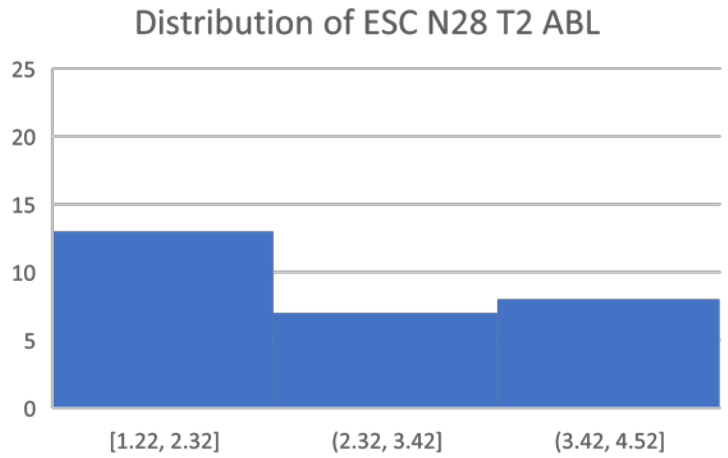
ESC in P N28

A more or less equal distribution in ESC was observed in mid-level and high-level performers although the number of moderates and mild IDs were not equal in size.



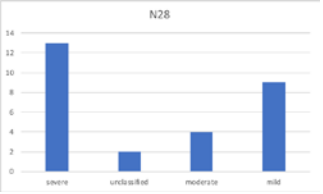
Esc in t1 N28

Finer dispersion of capacity levels showed a normal distribution of ESC in T1.

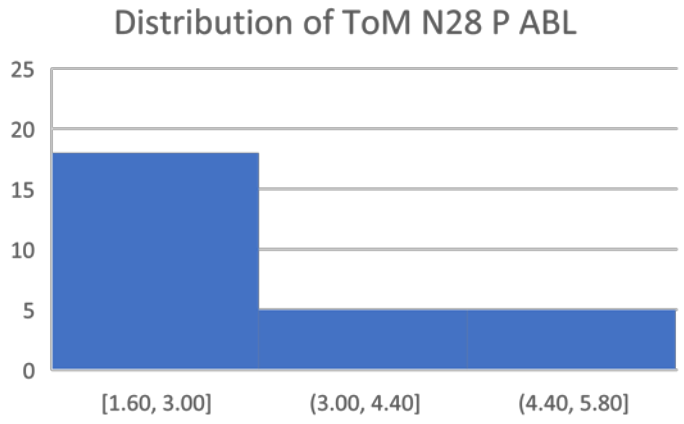


Esc in t2 N28

This grew into a bi-modal construct in T2, suggesting two different types of students using probably different strategies in ESC. We hypothesized one was verbal, and the other was non-verbal.

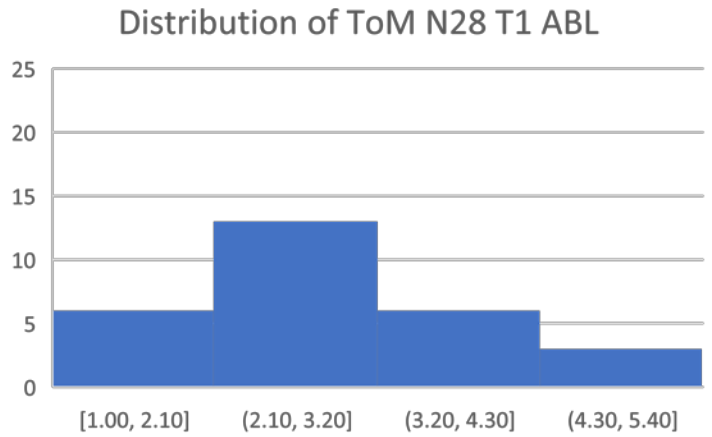


Growth in theory of mind



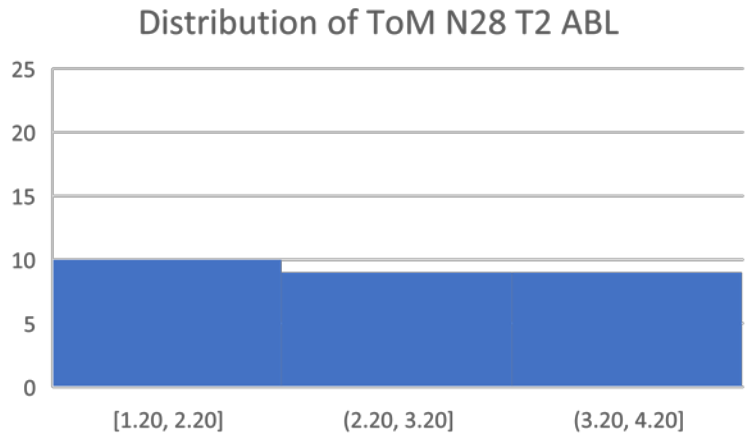
Tom in p N28

An equal distribution in Tom was observed in the mid-level and high level performers despite unequal distribution of moderates and mild ID in our sample population.



Tom in l1 N28

This grew into a normal distribution with four (instead of three) clusters in T1.



Tom in l2 n28

The continuous uniform distribution (rectangular distribution) in Tom among the three levels shows a symmetric distribution , suggesting that there was an equal chance of the severe, moderates and mild ID to fall into any category despite their intake. This also suggested that no other constraints, aside from the variable of TOM itself has affected the distribution curve.

Methodological constraints

1. Heterogeneous samples with lots of sub-groups; thus small group sample sizes;
2. To attain sensitive outcome measures, we recoded the items to illustrate increasing item demands and their appropriateness for age-matched sub-groups;
3. Mediation and moderation analysis were performed to establish a developmental pathway for the ID population.

Effectiveness of the measurement tool

- Changes of the distribution graphs have shown modified profiles where level of intelligence did not seem to be the sole decisive variable in predicting cognitive performance and social cognition.
- The new construct provide higher screening power (from 65% to 85%) and
- better attribution of students strength and weaknesses in the performance of the six generic skills.

Measurement vigor in intervention science

- Evaluation of programmew gains depends on:
- a) good data exploration;
- b) develop a sound theory-based expert construct for empirical test.
- c) compare your empirical data with the literature-led expert construct;
- d) Test the dimensionality of the expert construct; and
- e) draw hypothesis and go through regression analysis.

Programme effectiveness

- ABL and VRL develop a pedagogy that encourages an individual to collaborate, which in turn allows him/her to interact adaptively with the environment (Lacourse et al., 2004; Maravita et al., 2003), thus promoting the development of higher-level brain processes (Coghill, 1929; Herrick, 1956; as cited in Ayres, 1972).

Future direction

The team aims at developing:

1. A replicable treatment manual that standardized the VRL and ABL curriculum;
2. Based on teachers' assessment, we hope to demarcate the behavioral boundaries of the ID sub-types by developing algorithms for online assessment.
3. The aim is to attain sensitive measurement such that best fitting learning strategies for optimal gains in generic skills might be identified.

Acknowledgement

Jockey Club Experiential Learning Project for Students with Special Educational Needs 2019-2022

www.jcelp.org.hk/jcelp/