THE CONVERGENT VALIDITY OF THE UFS IN-HAND MANIPULATION ASSESSMENT INSTRUMENT FOR 3- AND 4-YEAR-OLD CHILDREN IN BLOEMFONTEIN

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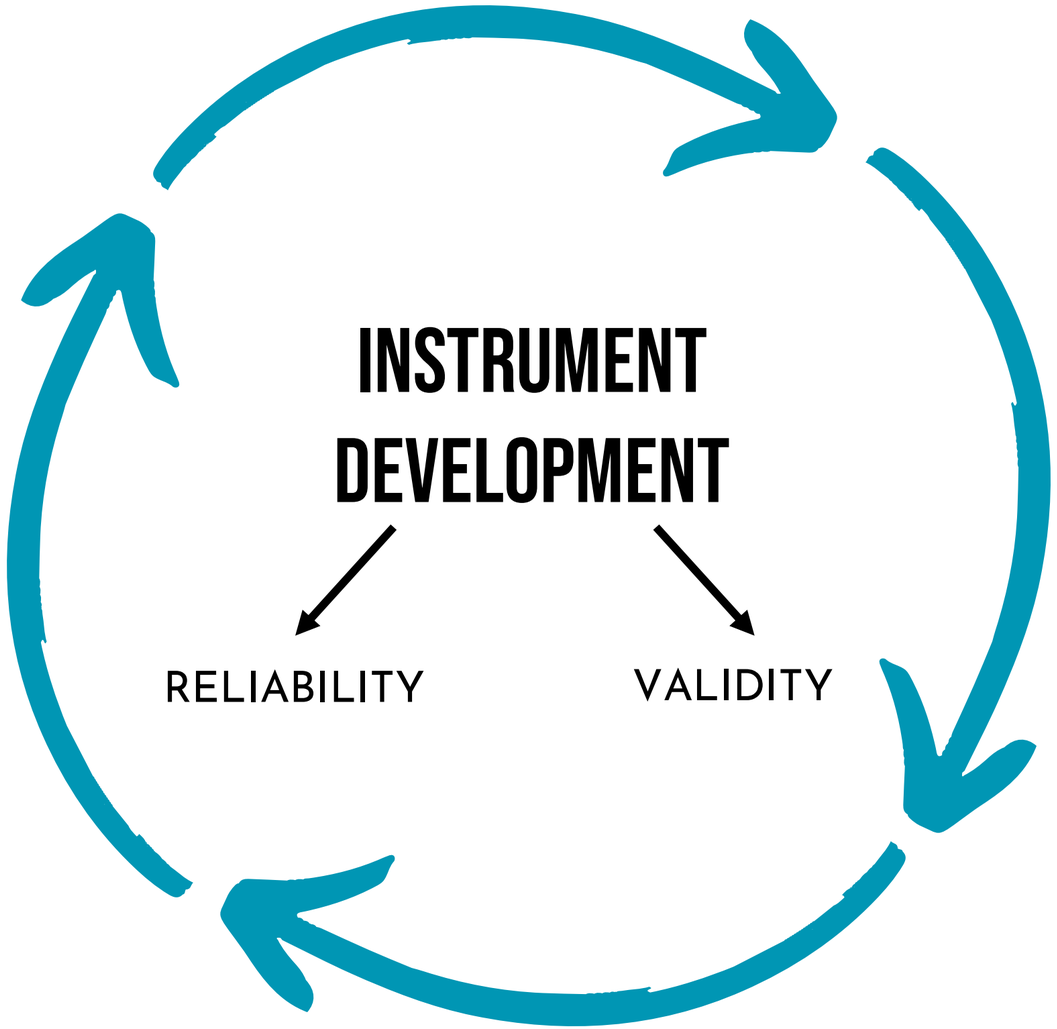
INTRODUCTION

- Use of standardized instruments within occupational therapy ☑



(Rudman & Hannah, 1998)

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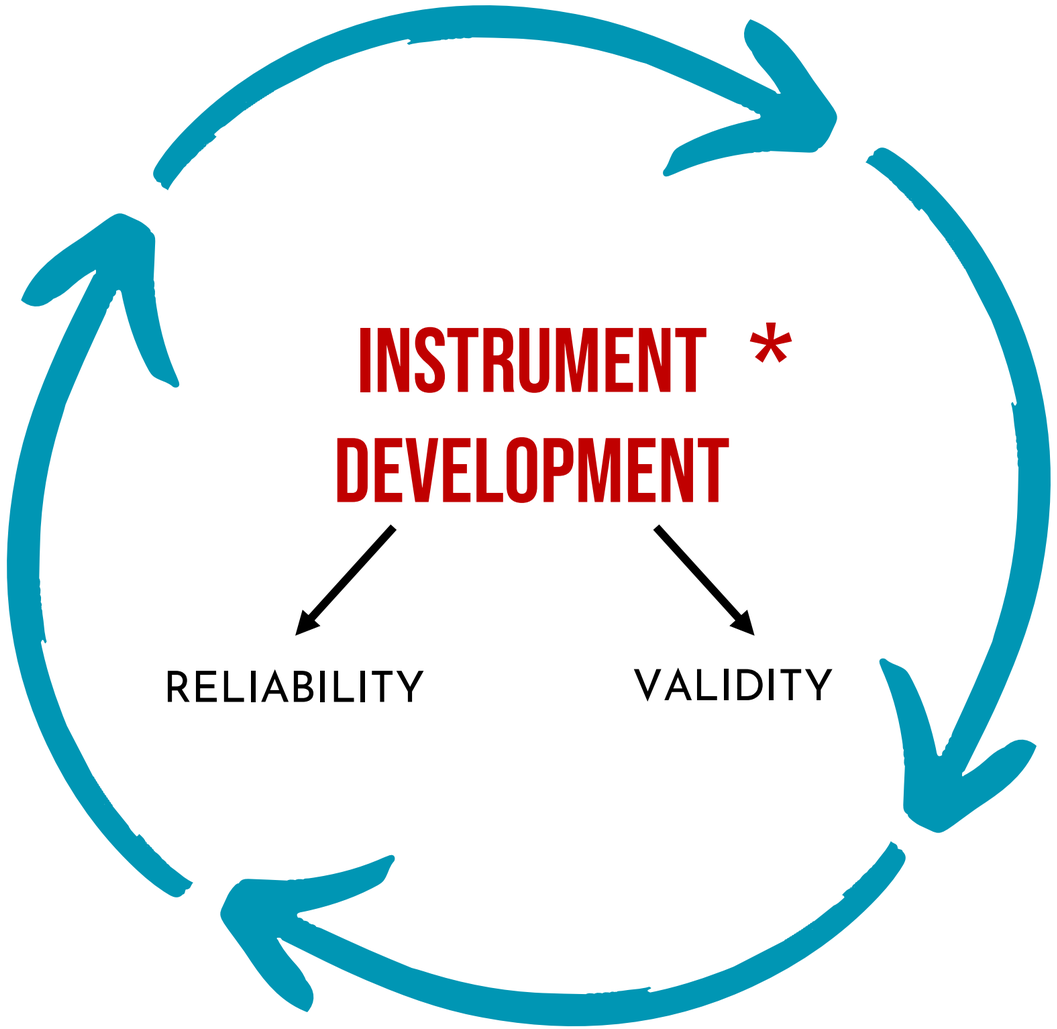


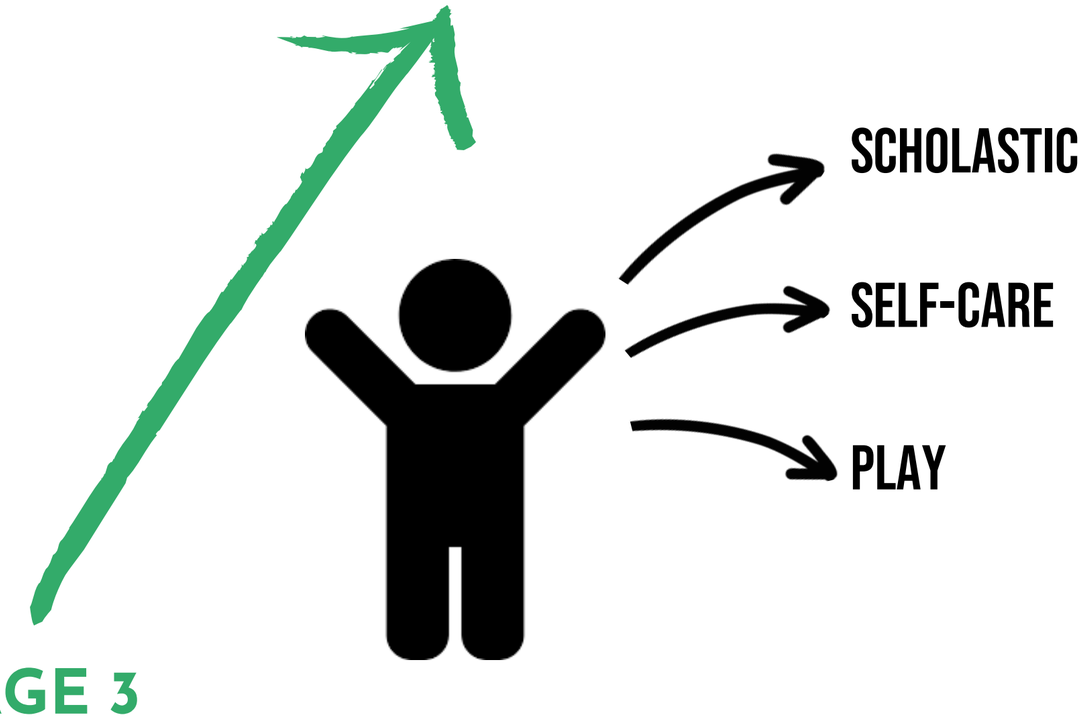
University of the Free State In-hand Manipulation Assessment Instrument

(Rudman & Hannah, 1998)

LITERATURE REVIEW

- **In-hand manipulation (IHM)** = "Ability of the hand to perform precise refined movements while also being able to adjust an object after grasping it."

- **IHM Components:**
  1) Simple shift
  2) Complex shift
  3) Finger-to-palm translation
  4) Palm-to-finger translation
  5) Simple rotation
  6) Complex rotation



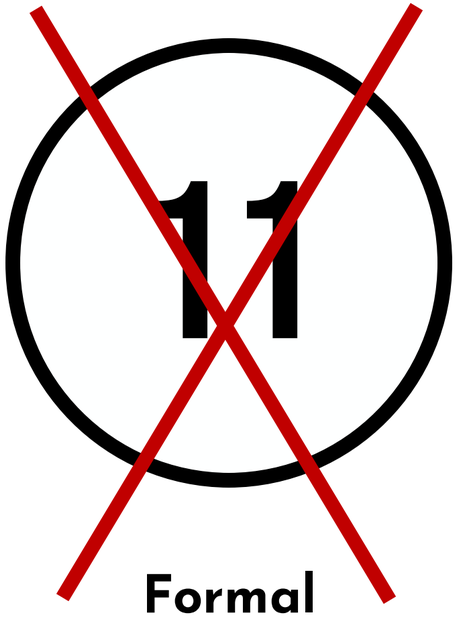
(Exner & Case-Smith, 2014; Kruger et al., 2021; Pont et al., 2009)

LITERATURE REVIEW

UFS IHM-AI

Informal screening methods

Need = Gold standard IHM instrument
RSA preferences



Formal instruments

(de Klerk et al., 2015; Howell et al., 2007; Kruger et al., 2021)

DEVELOPMENT OF UFS IHM-AI:

FUTURE STUDIES

- **Norms on scale:** Establish norms per age.

2023

2022

2019

2016

2014

- **Define concepts:** UFS In-hand Manipulation Checklist in children (ages 4-to-5)

(Streiner et al, 2015)

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DEVELOPMENT OF UFS IHM-AI:

FUTURE STUDIES

- **Norms on scale:** Establish norms per age.

2023

- **Validity & reliability**: 1) Test-retest reliability
  2) **Convergent validity**
  3) Intra- & inter-rater reliability

2022

- **Item analysis**: Modifications to UFS IHM-AI.
  : Construct validity (6-to-7 years)

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RESEARCH AIM

EXCLUSION CRITERIA

No 1) hand, 2) visual, 3) auditory, 4) cognitive pathologies.

+

No 5) therapy for such pathologies.

"determines the extent to which two or more instruments measure the same characteristic or outcome."

= To determine the convergent validity of the University of the Free State In-hand Manipulation Assessment Instrument in 'typical' children aged 3-4 years, in Bloemfontein.

(Nikolopoulou, 2022).

INSTRUMENTATION

UFS IHM-AI

*University of the Free State In-hand Manipulation Assessment Instrument

VS

FDT

*Functional Dexterity Test

INSTRUMENTATION

UFS IHM-AI

- 13 items (Part A & B)
- Assesses all 6 components of IHM
- Quality indicators & compensation strategies

(Tremblay et al., 2019; Aaron & Jansen, 2003)

INSTRUMENTATION

FDT

- Assesses hand **dexterity**
- Accuracy & speed of task performance
- 2 IHM components: 'simple shift' and 'complex rotation w/o stabilization'

(Tremblay et al., 2019; Aaron & Jansen, 2003)

INSTRUMENTATION

UFS IHM-AI

Justification for FDT use :

1) standardized
2) provides paediatric norms
3) psychometrically sound
4) commonly used by SA OTs
5) assesses two IHM components
6) resembles UFS IHM-AI test item 10A

FDT

(Tremblay et al., 2019; Aaron & Jansen, 2003)

METHODOLOGY

- **OVERARCHING MASTER'S DISSERTATION =** Bornman (2023)
- **STUDY DESIGN** = Quantitative methodological study design.

POPULATION

331 ECDs in Bloemfontein

'Typical' child:

Estimated 3 972 children aged 3-4 years

Bornman proposed to sample 300 children

Factor analysis method:
'10 respondents should be sampled per test item.'

Our objective: 50% of Bornman's sample

(Boateng et al., 2018b; Bornman, 2023; Comrey, 1988; Department of Basic Education, 2022; Grove et al., 2013; Guadagnoli & Velicer, 1988; Mbaugbaw et al., 2020)

SAMPLING: ECD centers

331 ECDs in Bloemfontein

Convenience sampling:
'Schools with a minimum of 10 children included. Data is feasible and inclusive.'

40 ECD centers sampled (20 registered and 20 unregistered)

Probability cluster sampling:
'Each participant has equal chance of being selected. Participants selected from ECD clusters."

Only **19** ECD centers provided consent

This study = **11/19** ECD centers sampled

7 registered, 4 unregistered

(Bornman, 2023; Maree et al., 2016)

SAMPLING: PARTICIPANTS

19 ECD centers provided consent

Non-probability, non-proportional quota sampling:
'Applied to ECD centers to select participants.'

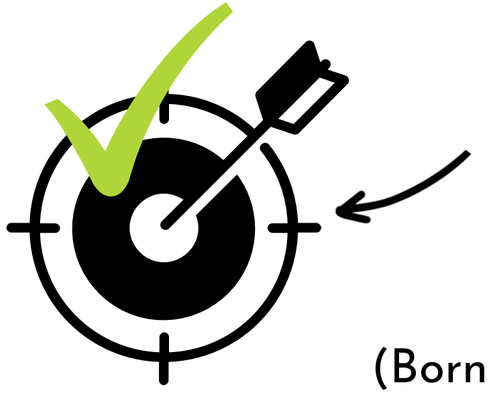
Round 1 sampling:
102 participants

Only 68% of proposed target (Bornman, 2023).
Hence, round 2 sampling was approved by HSREC.

Reasons for ineligibility:

1) no assent, 2) no consent, 3) does not meet inclusion criteria, 4) absenteeism

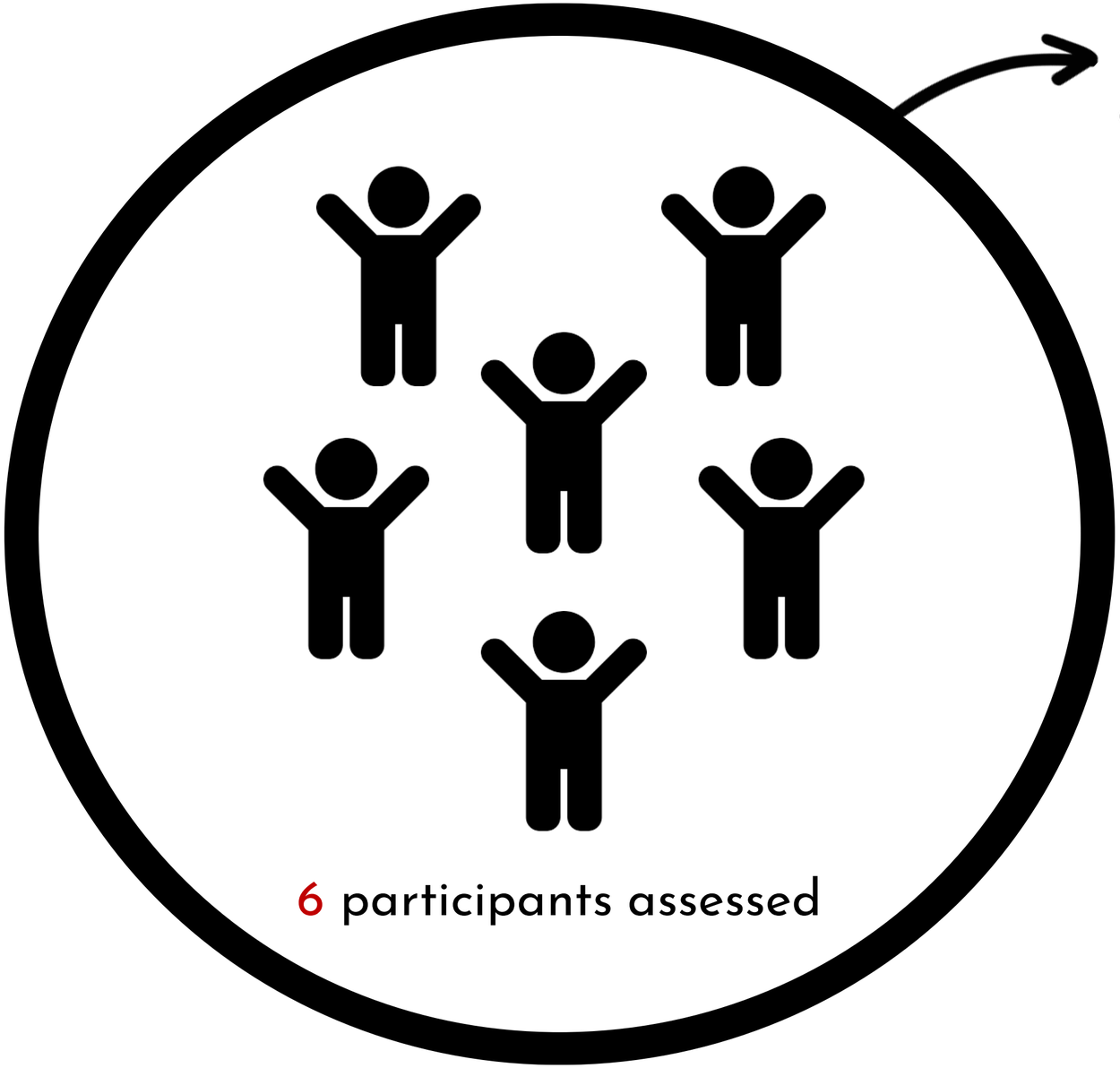
Round 2 sampling:
81 participants



152 participants sampled for this

(Bornman, 2023; Maree et al., 2016)

PILOT STUDY

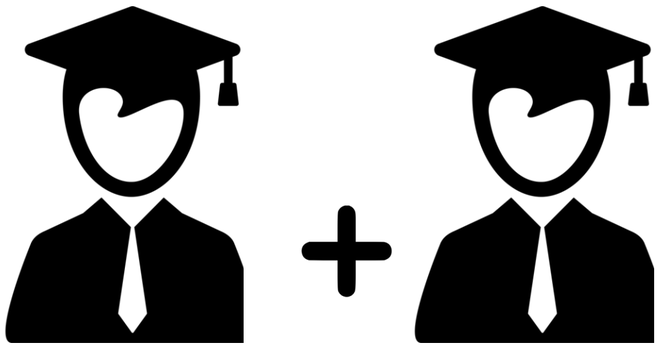


Data not included due to changes made:

- Scoring sheets - 'Unable to perform' option.'
- Administration instructions.

DATA COLLECTION + MANAGEMENT

- 3 weeks



Trained researchers worked in multilingual pairs

≠

Combat measurement errors

- Hardcopy scoring sheets → REDCap Excel
- Video footage → Figshare

ETHICAL CONSIDERATIONS

- Health Science Research Ethics Committee approval (number: UFS-HSD2022/1166/2305)
- Department of Education approval
- Informed consent & information letter (parental & principal)
- Child assent forms (voluntary participation)
- Confidentiality [POPIA] (participant code)

DATA ANALYSIS

- Descriptive statistics for categorical data were measured by the biostatistician.
- Median and interquartile range used (**skewed** data).
- **Paired analysis:** data of same child was compared in FDT & UFS instrument.
- **Signed-Rank test:** P-values to draw associations.

P-VALUE ≤ 0.05

= no association
(X convergence)

P-VALUE > 0.05

= association
(✓ convergence)

RESULTS AND DISCUSSION

VARIABLES		FREQUENCY n (%)
Gender	Male	67 (44.08)
	Female	85 (55.92)
ECD centers	Registered	7 (63.64)
	Unregistered	4 (36.36)
Hand dominance	Right	130 (87.84)
	Left	18 (12.16)
	Missing frequency	4 (2.63)
Ages (years, months)	3,0 - 3,11	75 (49.34)
	4,0 - 4,11	77 (50.66)
Languages of preference	Afrikaans	41 (26.97)
	English	11 (7.24)
	Sesotho and other	91 (59.87)

Demographic profile

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TEST ASPECTS COMPARED

FDT Penalty	UFS IHM-AI
Other hand to adjust	Stabilize against body
Touch board	Other (e.g., stabilize against surface)
Drop peg	Drop
Switch hand	Other body parts
Supination	Spatial orientation
Drop	Control and grading of force
Time without penalty	Item 10A – ‘Pegboard: Flipping pegs A’

Compensatory strategies

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Quality indicators

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Time without penalty	Item 10A – ‘Pegboard: Flipping pegs A’

7 items

Time

RESULTS AND DISCUSSON

FDT penalty	UFS IHM-AI Compensation strategy	UFS IHM-AI Item	Signed-Rank Test P-value
Touch board	Other (Stabilize on surface)	Item: 1A, 1B, 4A, 5A, 6A, 10A & 12A	<.0001
Other hand to adjust	Stabilized against body	Item: 1A, 1B, 4A, 5A, 6A, 10A & 12A	<.05
Drop peg	Drop	Item: 1A, 1B, 4A, 5A, 6A, 10A & 12A	<.0001
Switch hand	Other body parts	Item: 1B	0.2085 *
		Item: 5A	0.5293 *
		Item: 6A	0.0996*
		Item: 10A	0.3824*
		Item: 1A, 4A & 12A	<.05

TABLE 1

= dissociation/
no convergence

Key: UFS IHM-AI Items

1A = Stringing beads; 1B = Stringing beads; 4A = Piggy bank; 5A = Pencil game;

6A = Ruler game; 10A = Pegboard: Flipping pegs; 12A = Dressing game

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TABLE 1

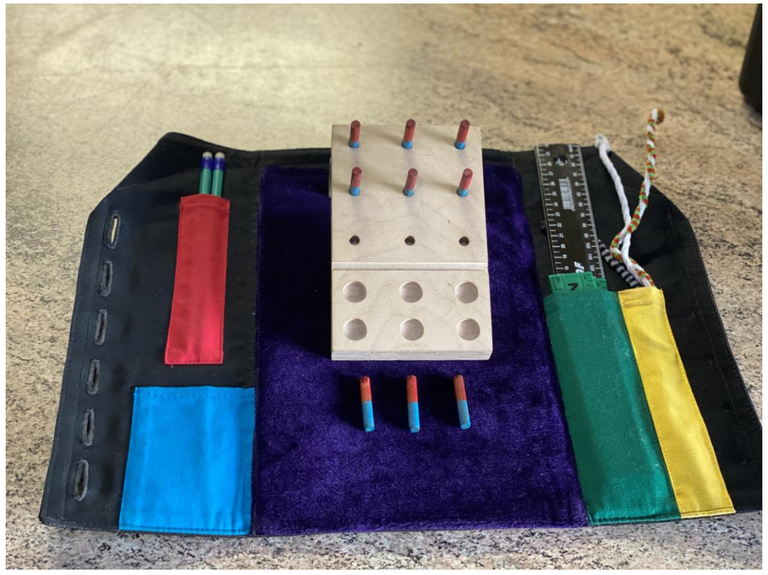
*= association/ convergence

RESULTS AND DISCUSSON

FDT penalty	UFS IHM-AI Quality indicator	UFS IHM-AI Item	Signed-Rank Test P-value
Supination	Spatial Orientation	Item: 1A	0.1230 *
		Item: 10A	0.1759 *
		Item: 1B, 4A, 5A, 6A & 12A	<.05
Drop peg	Control and grading of force	Item: 12A	0.1035 *
		Item: 1A, 1B, 4A, 5A, 6A & 10A	<.005

TABLE 2

*= association/ convergence



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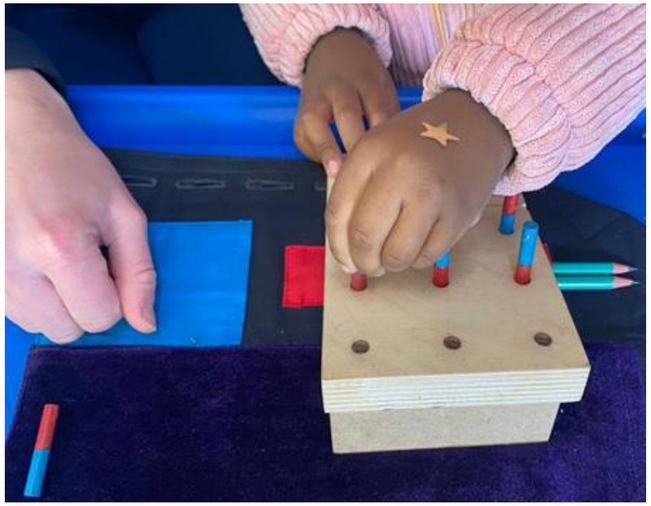


TABLE 3

Due to differences in:
1) administration
2) scoring
3) size and number of pegs
4) size of pegboards

Key: UFS IHM-AI Items

10A = Pegboard: Flipping pegs

LIMITATIONS + RECOMMENDATIONS

- Dexterity ≠ IHM.
- Size of equipment, scoring and administration methods influence test outcomes.
- FDT provides numerical data vs. UFS IHM-AI provides categorical data.

= lack of convergence between FDT and UFS IHM-AI.

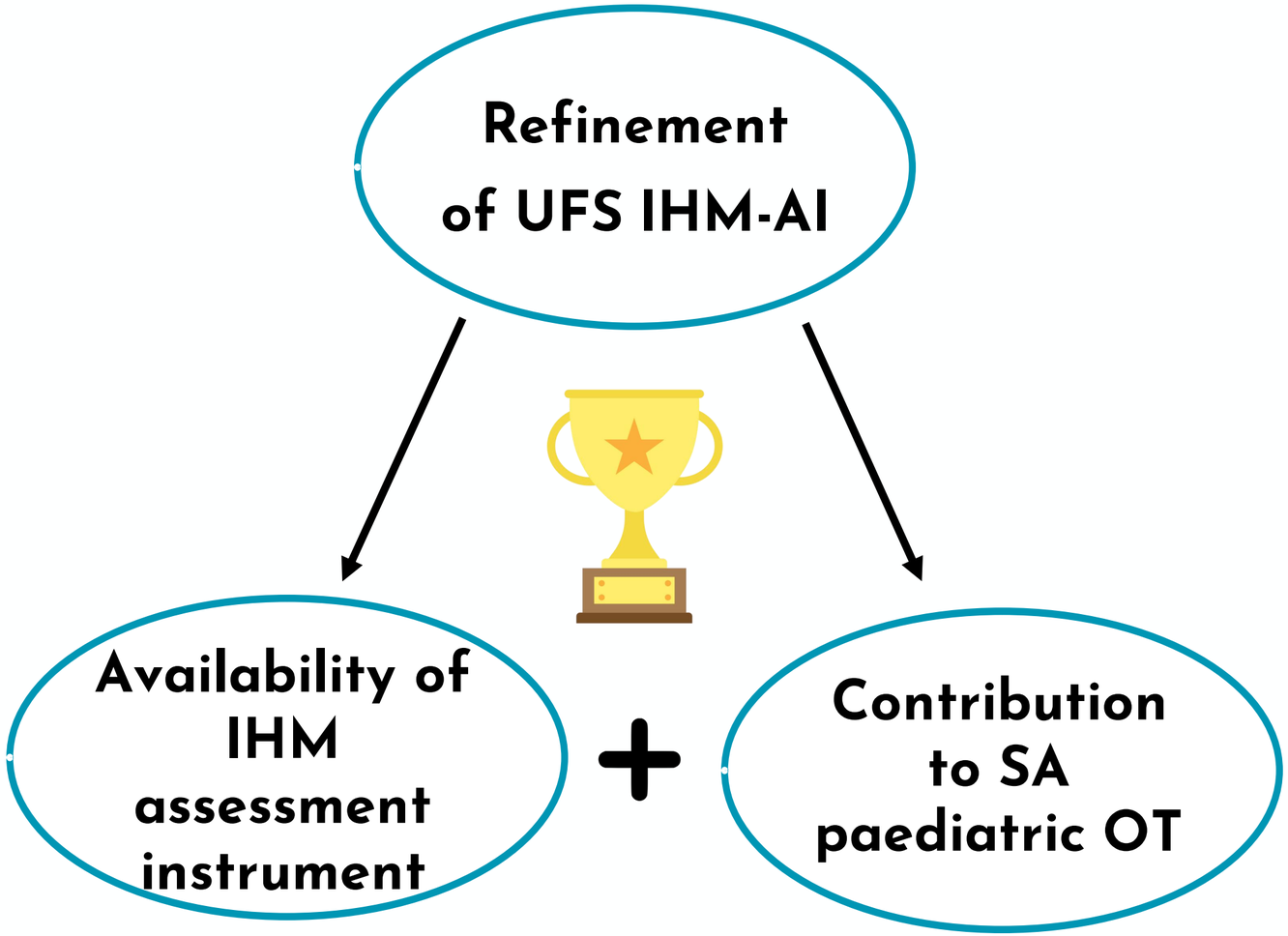
- Adapt UFS scoring sheet to incorporate numerical data.
- Follow-up convergent validity study on older population using Bruininks-Osretsky Test of Motor Proficiency (BOT-2) test.
- Revise instruction manual
- Investigate other psychometric properties.

(Carmosino et al., 2014).

CONCLUSION

- Lack of convergence = no suitable IHM instrument to compare UFS IHM-AI against.

Underscores unique attributes of UFS IHM-AI



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- The relevant **schools, teachers, guardians,** and **child participants** should be acknowledged for their time and patience.