

Validity and reliability of a new endurance test adapted to children aged 4-7 years

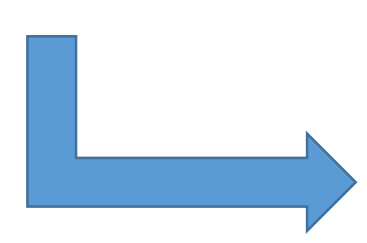
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Introduction

- Currently no field test assess aerobic endurance in children aged 4-7 years, while considering their physiological and psychological characteristics.
- The main validated test is a 3-minute continuous, round-trip 10m run (Ayan et al, 2015). However, studies show that intermittent effort is better suited to the physiological specifics of young children, notably due to their greater ability to recover quickly between brief efforts (Baquet et al., 2010).
- Furthermore, the integration of playful elements, such as imaginative storytelling or dramatizations, could not only increase the pleasure felt during effort, but also improve children's motivation and engagement (Howells et al., 2023). These playful approaches seem particularly relevant for encouraging adherence to physical activity from an early age, and it seems worthwhile to propose a positively perceived endurance assessment test for younger children.



The aim of this study is to develop a 3x1 minute intermittent endurance test (30 second recovery) accompanied by a playful story, adapted to children characteristic, and to verify IT-Story relevance and reproducibility.

Methods

Subjects

- 60 children (26 boys & 34 girls) from 4 to 7yo

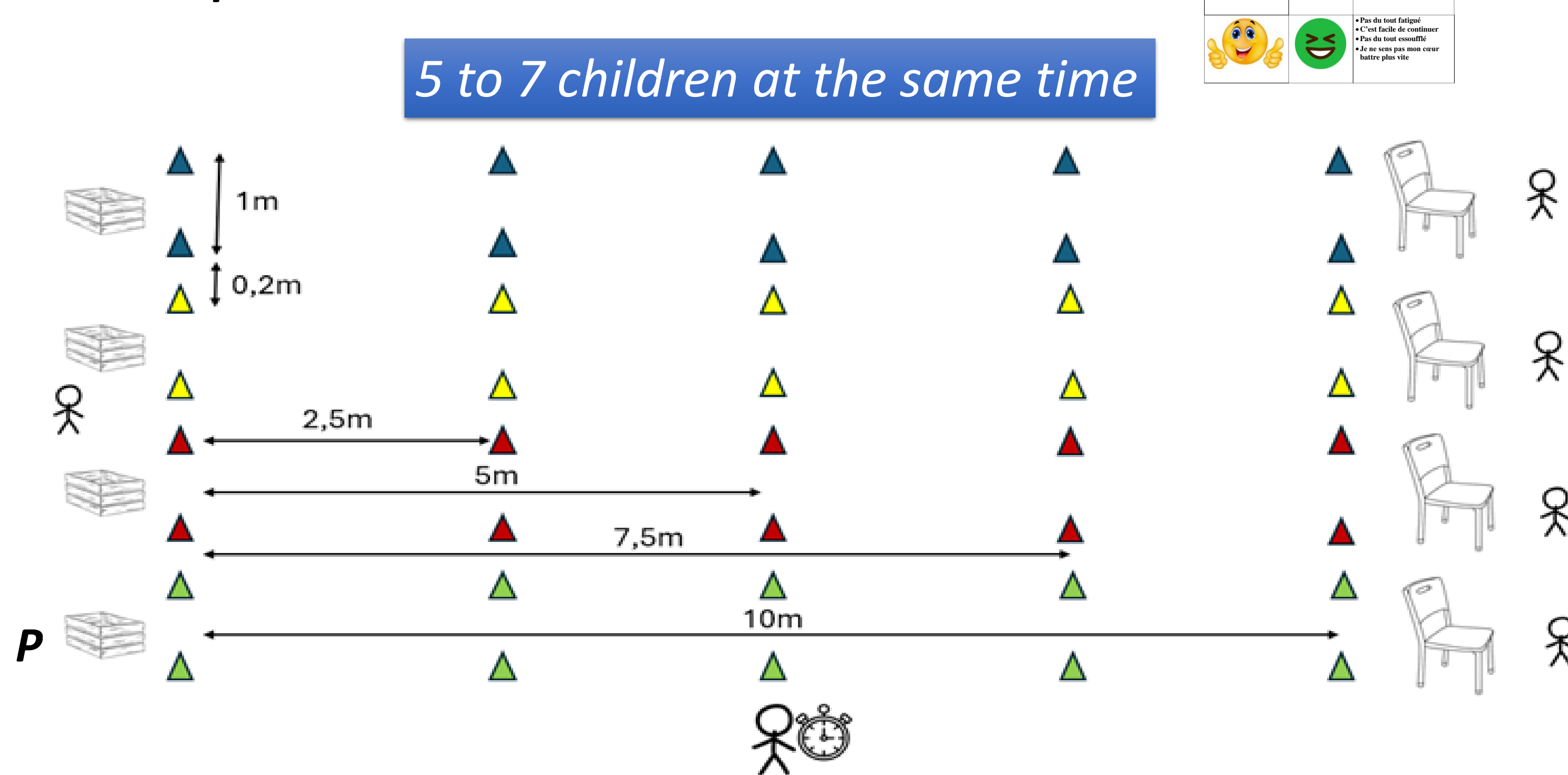
The intermittent test

- 3x1 minute intermittent endurance test (recovery = 30 seconds) on a 10m shuttle
- 2 modalities
 - Intermittent Test with playful Story (IT-Story)
 - Simple Intermittent Test (Simple-IT)

Mesurements

- Total distance (in meters)
- Level of exhaustion (5 levels emoji scale)
- Level of enjoyment (5 levels emoji scale)

Test set-up



Test effect : ns ; Age effect (p<0,001)

Results

Descriptive data

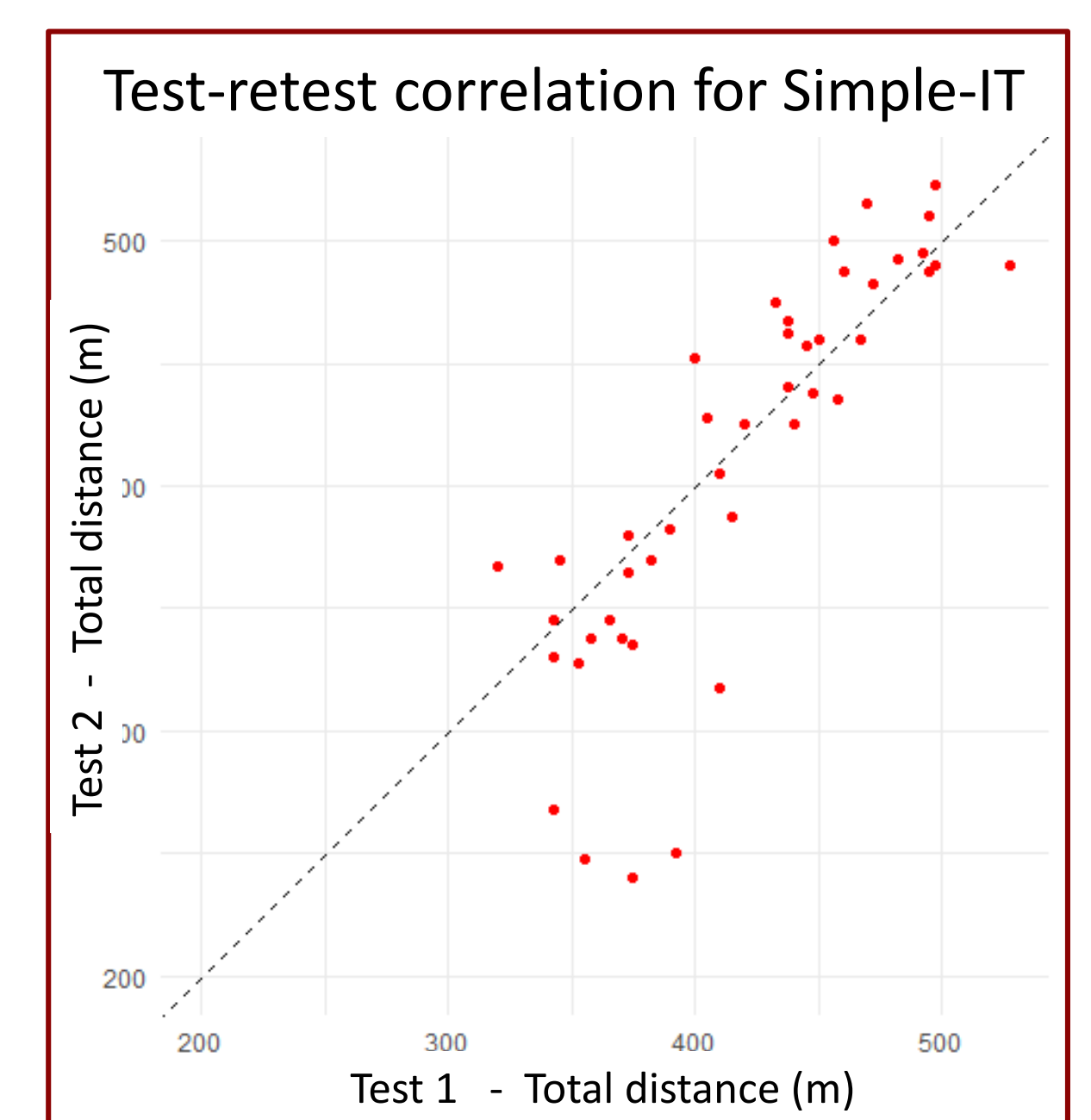
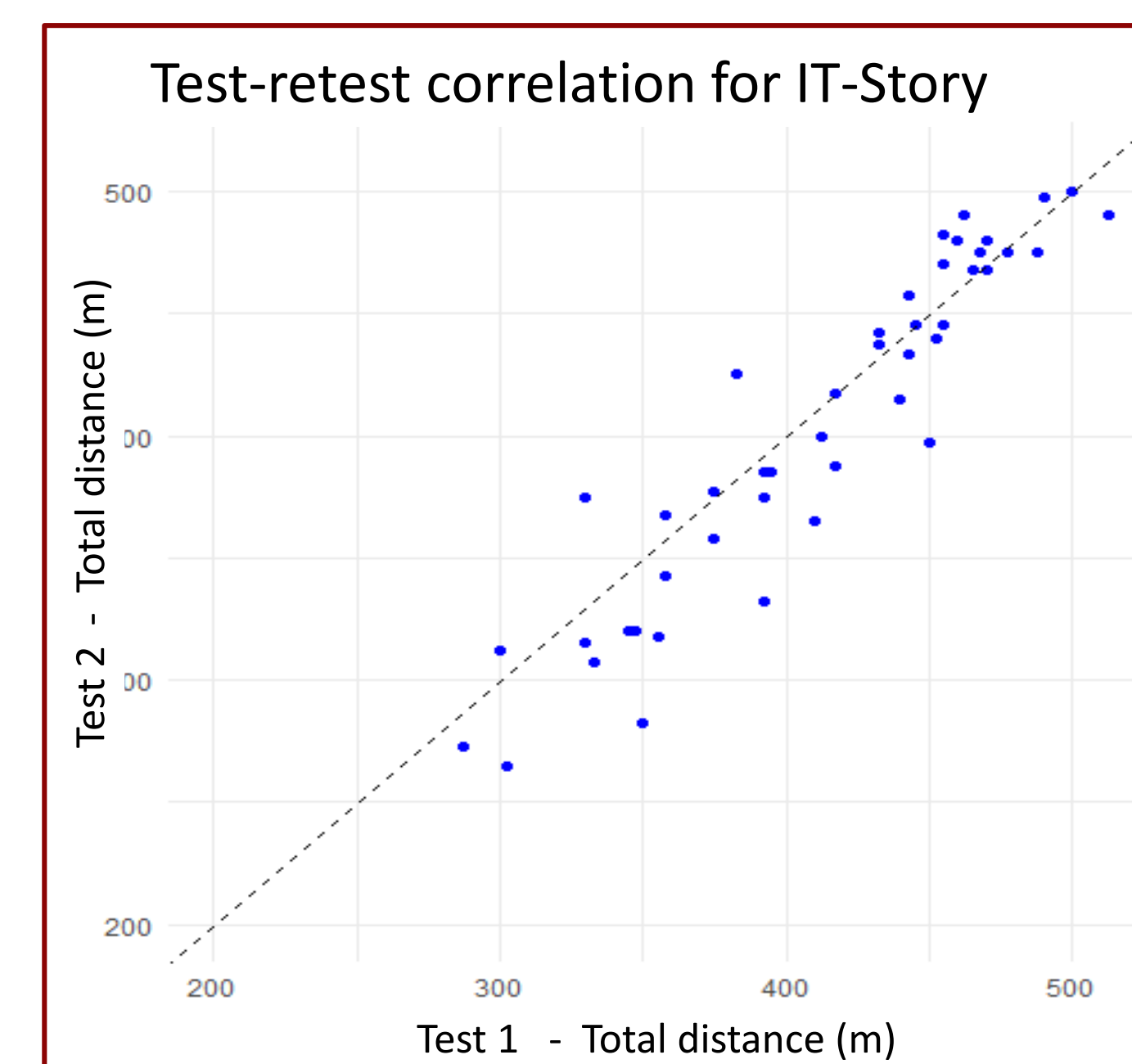
	IT-Story		Simple-IT		IT-Story		Simple-IT
Age	Total distance during 3x1' test (in m)			Age	Enjoyment	Exhaustion	
4yo	316 (286-326)	ns	330 (314-351)	4yo	4,00 ± 1,10	2,86 ± 1,67	3,95 ± 1,07
5yo	354 (341-369)	ns	365 (343-376)	5yo	4,61 ± 0,63	3,14 ± 1,56	4,32 ± 0,97
6yo	418 (395-450)	ns	408 (372-464)	6yo	5,00 (5,00-5,00)	3,12 ± 1,19	4,00* (3,00-5,00)
7yo	456 (436-476)	ns	454 (442-485)	7yo	5,00 (4,62-5,00)	3,48 ± 1,20	3,00* (3,00-3,50)

Modality effect : ns ; Age effect : p<0,001

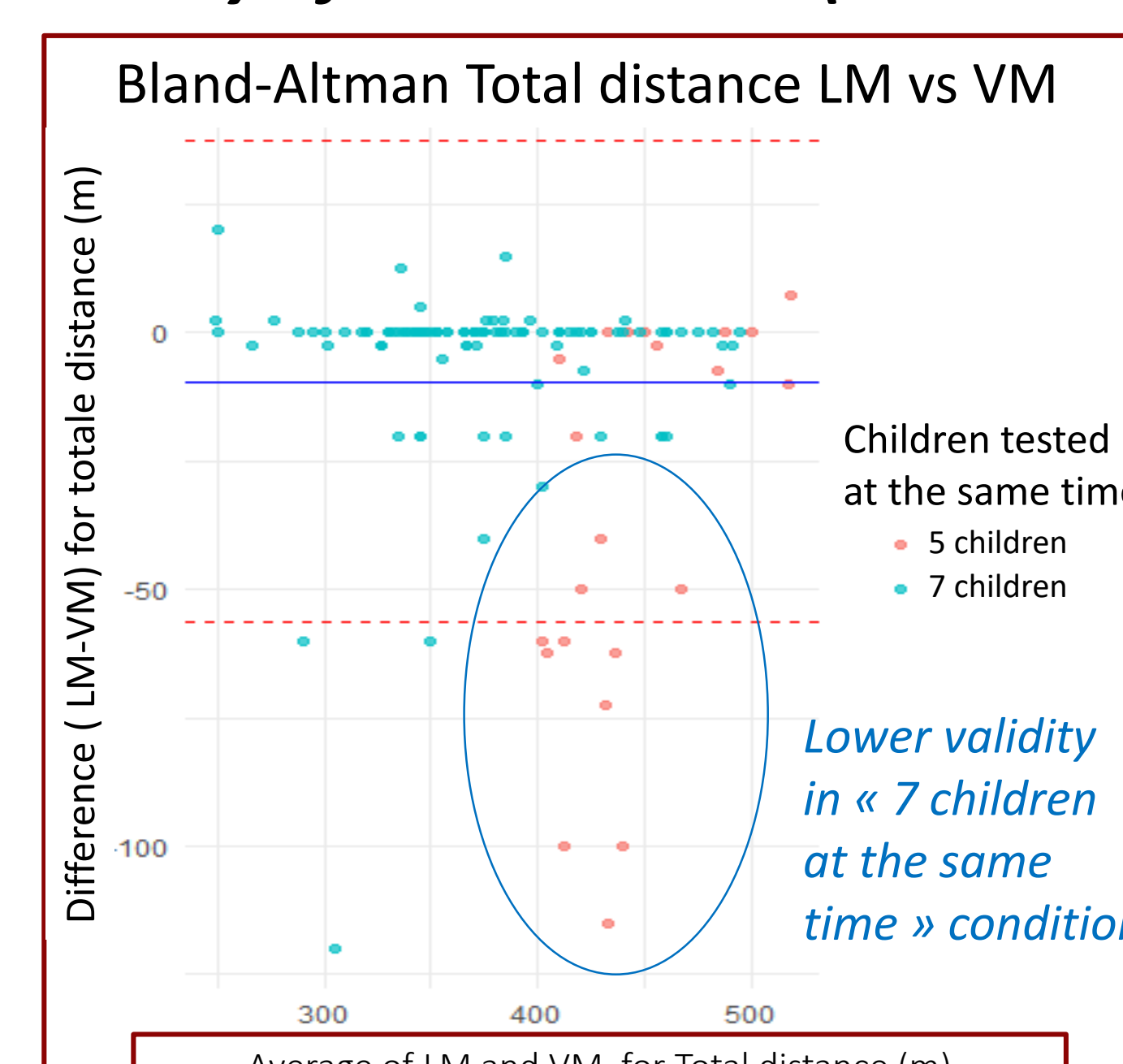
Modality effect : p<0,001 ; Age effect : p<0,001 Modality effect : ns ; Age effect : p<0,001

Test-retests reliability

C	IT-Story	Simple-IT
CV (%)	4.89%	8.06%
ICC	0.927 (IC95% : 0.872 – 0.959)	0.787 (IC95% : 0.644 – 0.877)
Conclusion	Very Good reliability	Good reliability



Validity of total distance (LM vs VM) Predictor of performance (MLR)



Variable	Coeff(β)	p Value	Interpretation
Âge (years)	38.23	< 0.001	+38.2 m per additional year
Gender (B/G)	16.84	0.044	+16.8 m for boys
Height (m)	276.80	0.041	+2.77 m per additional centimeter
Weight (kg)	-3.28	0.090	Not significant

Analysis

- Descriptive data
- Influence of test modality (Wilcoxon) and age (Kruskal-wallis) on performance, amusement and level of exhaustion
- Test-retest reliability (CV in % and ICC)
- Validity of total distance (comparison between live measurements (LM) by teacher and measurement through video recording (VM)).
- Predictive variable for performance (multiple linear regression)

CONCLUSION : The IT-Story is well adapted to 4 to 7 yo children. The test is associated with high level of enjoyment and lead to exhaustion. It has an excellent test-retest reliability. Validity of measurements depend on the number children to be tested at the same time. Further studies are needed to continue the tool validation process.

References

Ayán et al (2015) JSCR. 29(10), 2874-2880 ; Baquet et al (2010) JSCR 24(5), 1381-1388 ; Howells et al (2023) JECER (12)1.