PEPPERDINE

Forward Functional Reach Centile Curves for Younger Individuals with Intellectual Disabilities from North America

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Introduction

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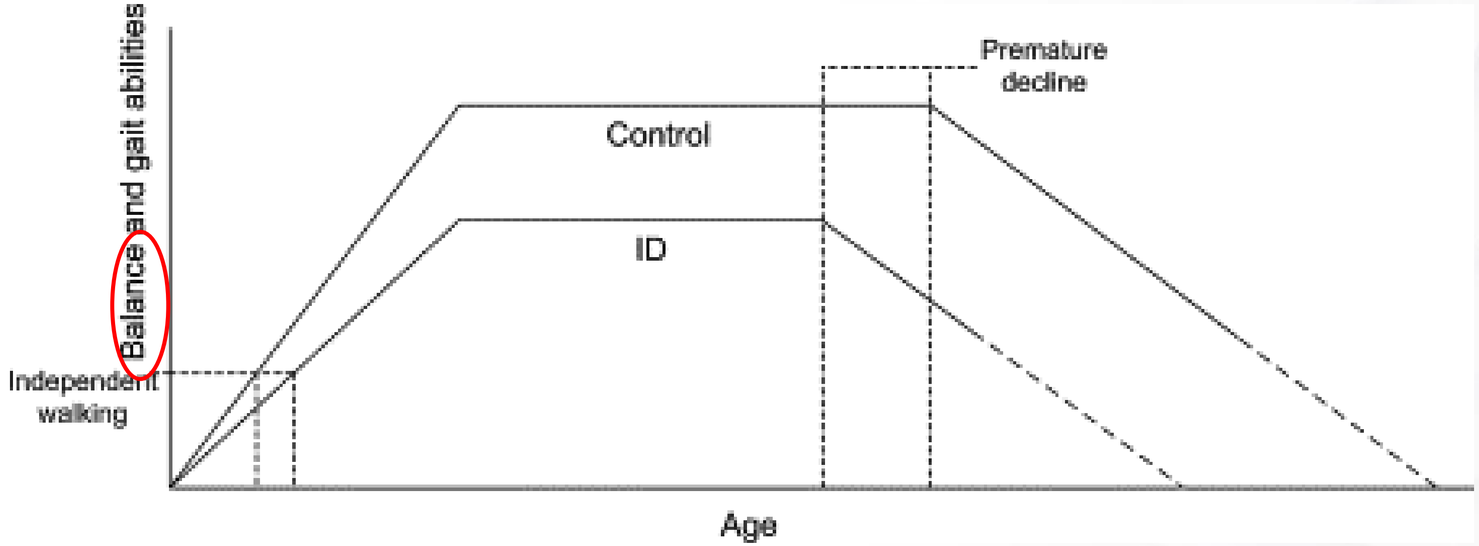
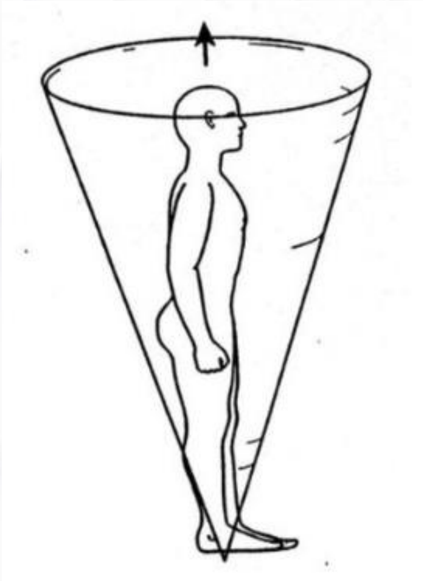


Conceptual model of balance and gait capacities during the lifespan of persons with ID and controls.

Introduction (Cont.)

- Forward functional reach
  - Surrogate measure of stability limits



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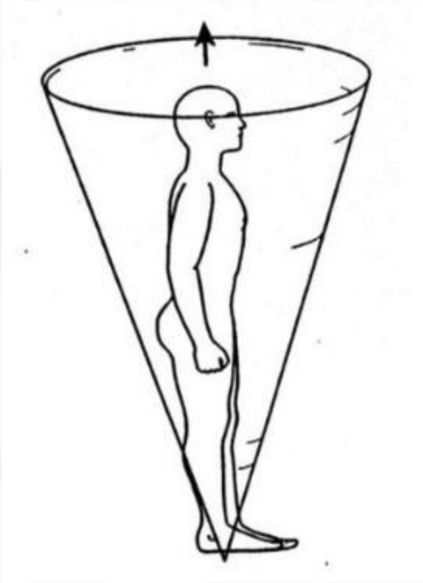

- Clinical significance, functional impact, and implications
  - Assesses a form of voluntary, dynamic motor control
  - *May associate with or influence:
    - Falls, frailty, activities of daily living, independence/safety, mobility, self-perceptions, and/or other health-related (e.g., neuromuscular, musculoskeletal) outcomes, etc.

Such evidence has not been robustly established within ID, especially within younger individuals with ID.

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- The forward functional reach is:
  - Under-examined in younger individuals with ID
  - Difficult for a practitioner/clinician/researcher to interpret
    - No population- and task-specific normative data exist
      - Normative data: could directly impact educational and therapeutic assessment practices/outcomes for this population

Introduction (Cont.)

- Generalized additive model for location, scale and shape (GAMLSS)
  - A form of supervised machine learning
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  - Can be used to create centiles (e.g., World Health Organization)

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  - Considers the parameters of a distribution
    - μ = location (e.g., measure of central tendency)
    - σ = scale (e.g., variance [e.g., coefficient of variation; SD])
    - ν = shape symmetry (i.e., skewness)
    - τ = shape amplitude (i.e., kurtosis)

Introduction (Cont.)

The purpose of this study was to develop age- and sex-specific GAMLSS -derived centile curves for the right- and left-arm forward functional reaches from younger (8-21 years) North Americans with ID.

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- Secondary data analysis of FUNfitness data set
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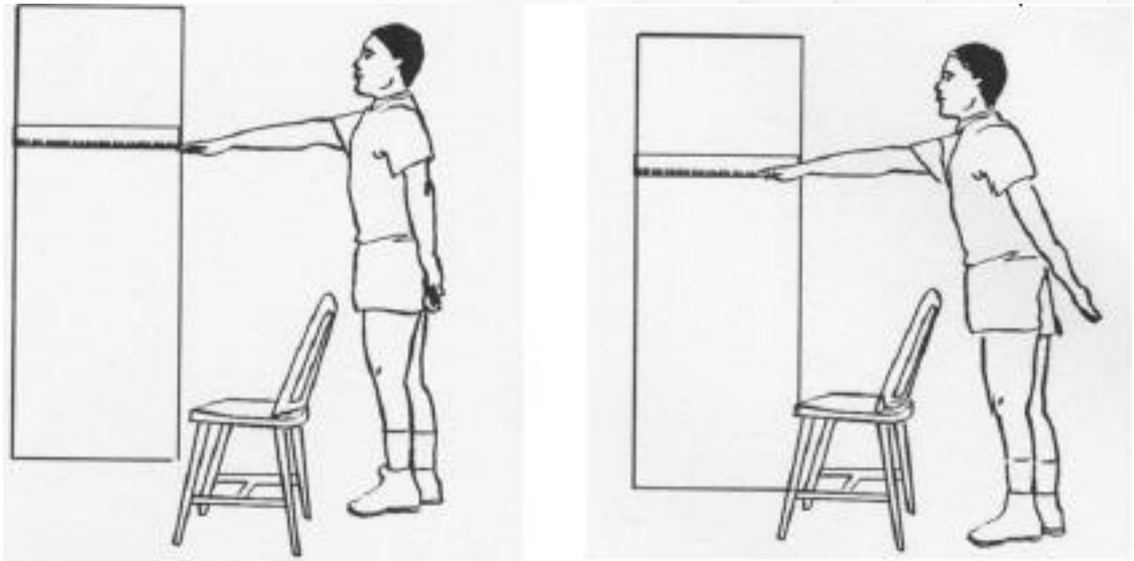
- (Dynamic) Balance Screening
  - One-arm forward functional reach (cm)
    - Right and left



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  - Full data set: 7 Special Olympics regions; 113,276 entries
    - Reduced to North American region; had to have a known sex and age of 8-21 years

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- Data Cleaning
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    - Reduced to North American region; had to have a known sex and age of 8-21 years
    - Removed those who:
      - Were explicitly identified as “did not complete” the reach
      - Received ‘zero’ scores for *both* reaches (i.e., assumed “did not complete” entries)
      - Did not have entries for at least *one* reach (i.e., entries with two ‘blanks’)

Methods (Cont.)

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  - Removed:
    - Entries with either reach above 66 cm (for boys) and 60 cm (for girls)
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        - Was most conservative method; cut-off seemed most realistic

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    - Repeated measures if a unique individual had more than one measurement at a given age
      - If applicable, first measurement was retained

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- *N*=12,932
  - Mean age (years): 15.87 (SD=3.51)
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- Data Imputation
  - All entries had at least *one* (i.e., right or left) reach score
    - 832 (6.43%) and 282 (2.18%) missing right and left reach scores, respectively
  - missForest imputation
    - Estimated error rate (1= poor; 0= good) was exceptionally small = .0007

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  5. Estimate centiles

Results

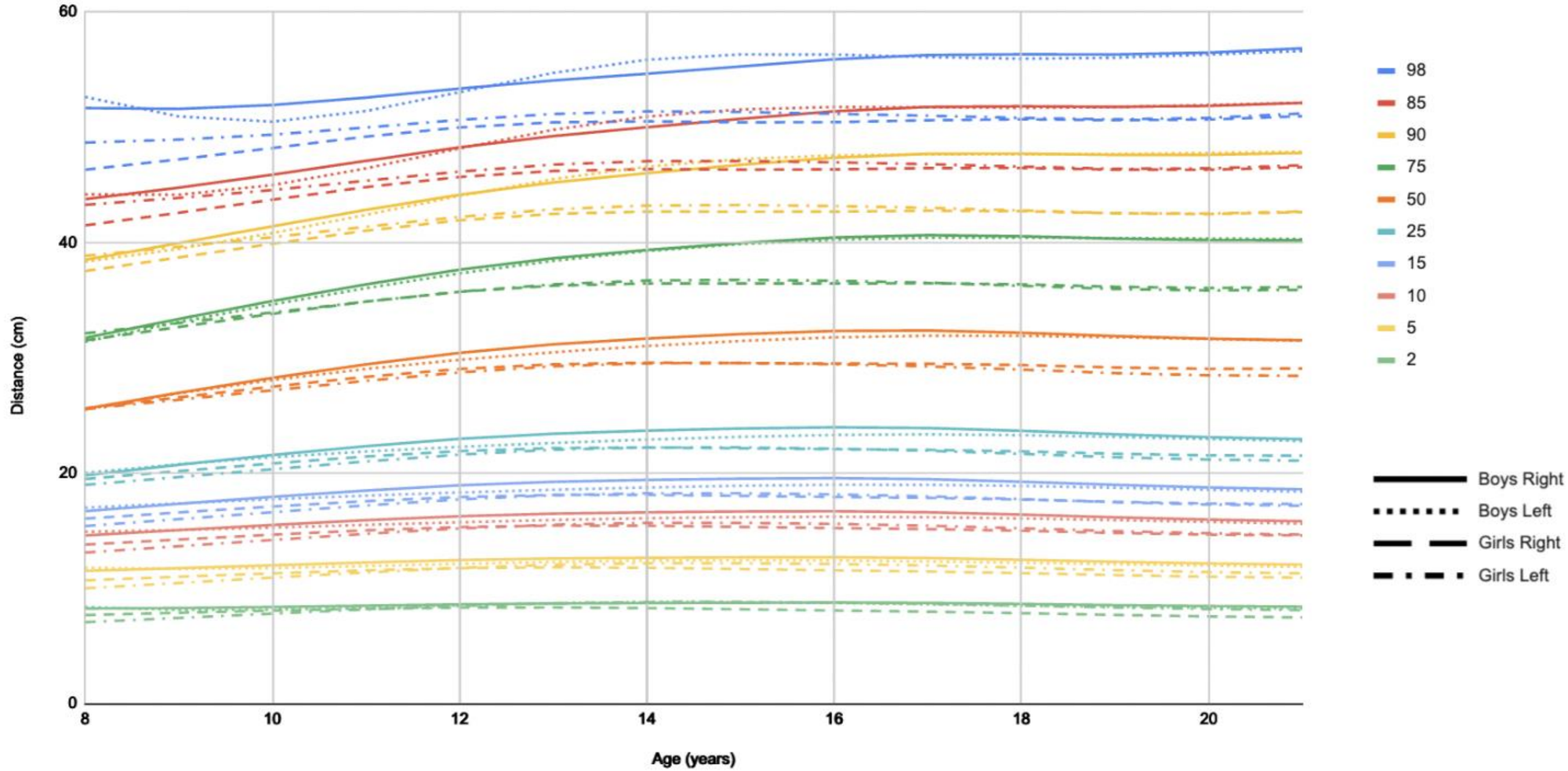
Final distributions/models for the forward functional reach.

Biological Sex	Arm	Distribution/Model
Boy	Right	logJSU
	Left	logJSU*
Girl	Right	logSEP4
	Left	logSEP4

log = exponentially transformed from 0 to infinity
JSU = Johnson's SU (second parameterization)
SEP4 = skew exponential power type 4
* = smoothed (k=4)
Note. Worm plots for all four distributions/models were satisfactory.

N=12,932
Mean (SD) right-arm reach (cm) = 30.43 (11.23)
Mean (SD) left-arm reach (cm) = 30.25 (11.33)

Results (Cont.)



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- Practitioners will be able to determine normative performance for the right- and left-arm forward functional reach in North Americans with ID aged 8-21years

- These results have the potential to directly impact educational and therapeutic assessment practices/outcomes for this population (e.g., relative performance, screening, placement, goal-setting, inform interventions)

Acknowledgements

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References

1)

Questions?

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FUNCTIONAL REACH TEST

Forward Reach Without Loss of Balance

REACH

Description

The forward [functional?] reach test is a simple method to quantify balance that allows use of visual cues, but perturbs body position. The test requires the athlete to reach forward beyond the length of his/her arm without loss of balance. The preferred position for this test is standing, but it can also be done sitting.

Mode of administration

- PT attaches a tape measure to a wall or partition, horizontal to the floor at the shoulder level of the athlete.
- Participant stands on two legs, positioned shoulder width apart.
- Test can be done seated if the athlete cannot stand.
- Athlete is placed within arms' reach of a chair for security.
- Arms are positioned at the sides. One arm remains relaxed in this position for the entire test.
- Athlete is requested to lift one arm to 90 degrees forward flexion and extend fingers.
- PT demonstrates the test.
- PT stands in front of athlete to encourage the athlete to continue without fear of falling.
- PTA or student stands next to athlete for safety.
- PT puts a clipboard at the end of the athlete's longest fingertip to record the starting position.
- PT coaches athlete with a "ready, set, reach as far forward as you can without losing your balance."
- PT uses the clipboard to record the final position of the fingers.

Scoring

- PT, PTA or student stands at the end of the athlete's fingers.
- Record the starting position with the use of a clipboard on the ruler at the end of the longest finger.
- After the athlete bends forward, use the clipboard to record the inch measurement at the end of the longest fingertip as the athlete reaches without loss of balance. Record reach on both sides.

Reach of fewer than 8 inches/20.3 centimeters or asymmetry may indicate need for education.