Characterizing chemotherapy related somatosensory impairment

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INTRODUCTION

Despite a need for characterizing somatosensory impairment in pediatric populations there are no universally accepted somatosensory assessments. The purpose of this work is to use novel measures of proprioceptive and haptic function to characterize chemotherapy-induced peripheral neuropathy (CIPN) in individuals treated with chemotherapy for pediatric cancer.

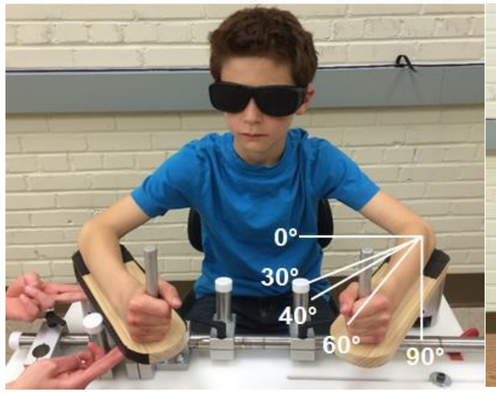
METHODS

Participants

	Assessment	Children		Adults	
Control Groups		N	Age (y)	N	Age (y)
Inclusion criteria: no known neurological disorder or condition affecting somatosensation	Proprioceptive acuity	308	5 - 17	26	18 - 25
	Haptic acuity	59	9 - 12	27	19 - 25
	Haptic sensitivity	56	9 - 12	27	19 - 25

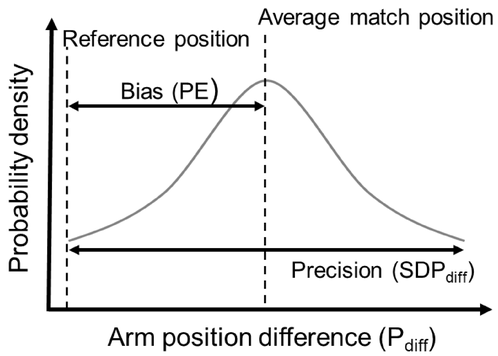
	Children		Adults	
Chemotherapy Group	N	Age (y)	N	Age (y)
Inclusion criteria: no cranial cancer, treated with plant alkaloids (e.g. Vincristine, Vinblastine)	6	6 - 17	9	18 - 25
Diagnoses: Lymphoma, Langerhans cell histiocytosis, Ewing's sarcoma, Nodular sclerosis, Hodgkin's lymphoma, Lymphoblastic leukemia, malignant neoplasm, pancreatic tumor				

Equipment

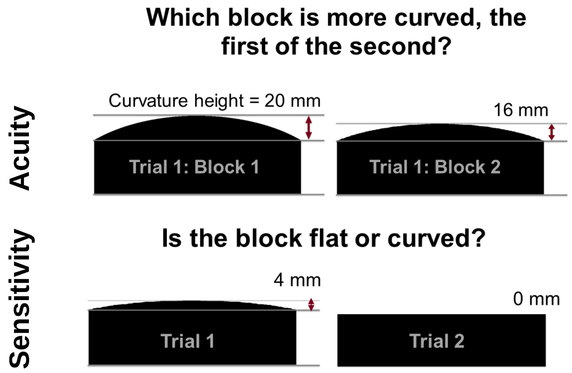


- Proprioceptive acuity assessment: contralateral limb position matching (left)
- Haptic assessment: "active touch" surface exploration of precision tooled plastic blocks (right)
  - Acuity – curvature discrimination task
  - Sensitivity – curvature detection task

Proprioceptive measures: bias and precision



Haptic measures: psychophysical thresholds

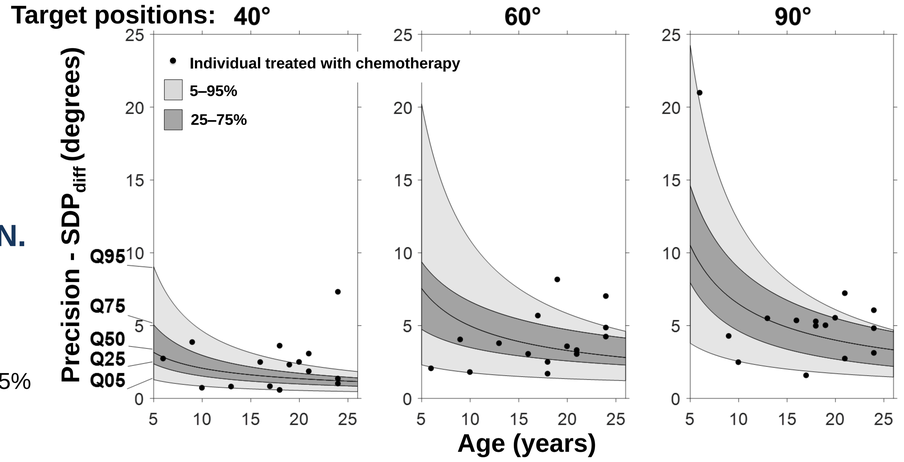


RESULTS

This proprioceptive assessment can identify proprioceptive impairment in individuals with CIPN.

No notable bias findings

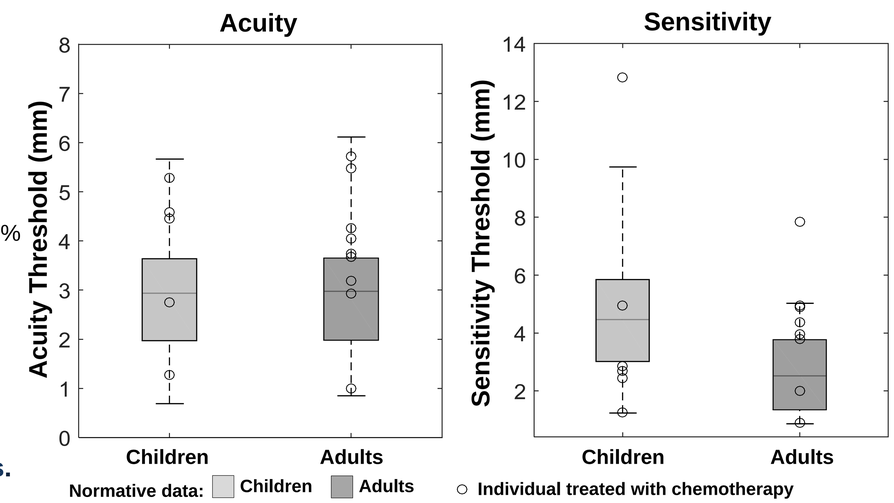
Precision
- 46% of individuals are > 75%
- 38% are > 95%



Our haptic assessment can successfully identify haptic impairment in individuals treated with chemotherapy.

- 64% acuity thresholds > 75%
- 50% sensitivity thresholds >75%

80% of the variability in acuity threshold is explained by cumulative dosage of chemotherapeutic agents.



CONCLUSIONS

- The proprioceptive and haptic assessments identify CIPN-related somatosensory impairment.
- CIPN-related proprioceptive impairment affects limb position precision, not bias.
- Haptics: The haptic acuity measure is the recommended sensory measure as it was correlated with cumulative dosage of chemotherapy.

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