



UNIVERSITÀ
DEGLI STUDI
DI PADOVA



Clinica di
Oncoematologia
Pediatria di Padova



SCREENING AND STRENGTHENING ACTIVITIES OF FINE MOTOR SKILLS IN PEDIATRIC PATIENTS UNDER TREATMENT FOR ONCOHEMATOLOGICAL DISEASES

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FINE MOTOR SKILLS IN PATIENTS WITH ONCOHEMATOLOGICAL DISEASES

Ability to coordinate a group of small muscles that promote movements such as grabbing, twisting and threading. (John, 2013)

○ It favors the acquisition of **autonomy** (Axford et al., 2018)

○ It stimulates **exploration, creativity** and **curiosity** (Axford et al., 2018; Lopes et al., 2013)

○ It enhances **concentration** (Vieira et al., 2017)

○ It strengthens **self-esteem** and a sense of **self-confidence** (McHale et al., 1992)

○ It is indispensable for learning **writing** and **reading** and it influences subsequent school performance (McGlashan et al., 2017; Taverna et al., 2017)

Oncohematological
disease

- **Neuromuscular deficits** and **atrophies** (Scheede-Bergdahl et al., 2013)
- Difficulty in **fine motor dexterity** and **manual coordination** (De Luca et al., 2013; Green et al., 2013; Taverna et al., 2017; Tremolada et al., 2018)
- **Visual-motor** difficulty (Green et al., 2013; Hockenberry et al., 2007; Balsamo et al., 2015)
- Difficulty in **writing tasks** (Goebel et al., 2019)
- Decrease in **precision** and **speed of the stroke** and **increase in pressure** (Reinders - Messelink et al., 2001)

OBJECTIVES

Assessment of fine motor skills in pediatric patients in treatment for oncohematological disease

Promote the acquisition of manual dexterity, strength in the hands and enhance grapho-motor skills



PARTICIPANTS

53 children:
27 males
26 females
Median age: 5.86
(SD=2.04)
(*range 3-10 anni*)



DIAGNOSIS

- 29 ALL SR and LNH
- 18 AML and ALL HR
- 6 aplastic anemia

EXCLUSION CRITERIA

- HSCT Ward
- Terminal phase
- Physical disfunctions

Caucasian (75.5%) and all non-Caucasian speaking Italian

STARTING ASSESSMENT

Assessment tools

- MOVEMENT ABC-2 (MD1, MD2, MD3)
- VMI
- Socio-demographic and technological devices use questionnaires

INTERVENTION

Assessment tools

- Observative sheets

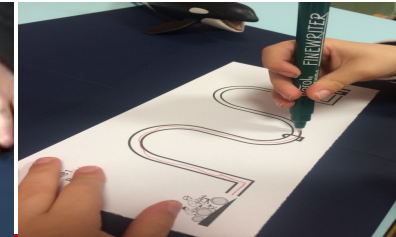
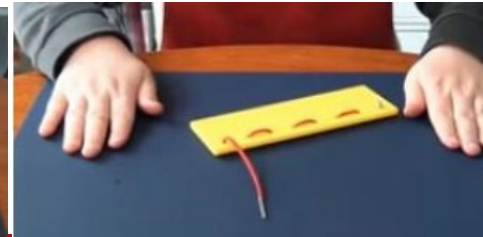
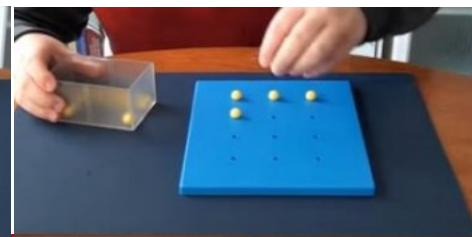
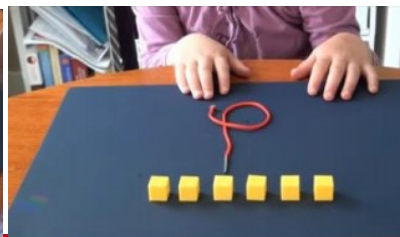
ACTIVITY EXAMPLES

- Color, cut out, fold the paper
- Thread
- Gripping/manual work
- Precision work
- Model

FINAL ASSESSMENT

Assessment tools

- MOVEMENT ABC-2 (MD1, MD2, MD3)
- VMI



*Children during the
Movement ABC test*

ACTIVITY EXAMPLES

Low difficulty



Mean difficulty

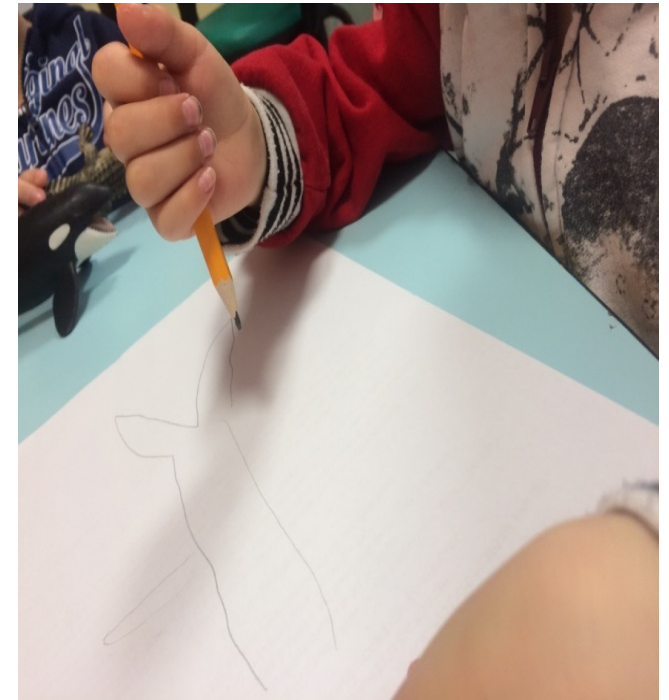


High difficulty



PRELIMINARY OBSERVATIONS

- Difficulty in pencil grip
- Few difficulties in finger-palm translation and palm-finger translation
- Fatigue and low hands-strength
- Longer duration time of the activities
- Incorrect posture
- Hyperactivity
- Enthusiasm and need to make the “games”
- Difficulty to understand the delivery
- Amelioration of percentiles in Movement ABC-2 Battery



Child aged 4.04 years old during free drawing: difficulty in pencil grip

PRELIMINARY OBSERVATIONS

VMI made using Graphical tablet with software CSWIN:
good approach to technology

- Spatial resolution is around 0,5 mm
- Temporal resolution is around 200 Hz
- Precision is around 0,1 mm



IT ASSESSES SEVERAL
PARAMETERS:

- Time on the paper
- Time in the air
- Speed
- Speed reversals
- Frequency (Hz)
- Pressure
- Test time

RESEARCH AREAS

- A** - Assessment of **manual dexterity and visuo- motor skills**.
- B** - **Socio-demographic characteristics** that influence fine motor skills scores.
- C** - **Technological devices** and fine motor skills.
- D** - Improvements following the **fine motor training**.

RESULTS:

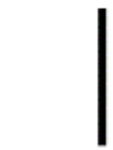
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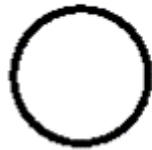
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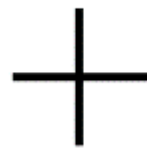
1. Vertical line



2. Horizontal line



3. Circle



4. Cross



5. Right oblique line



6. Square



7. Left oblique line



8. Oblique Cross



9. Triangle



10. Open square & circle



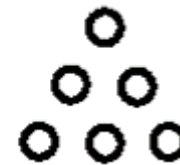
11. 3-line cross



12. Arrows



13. 2-D rings



14. Six circles



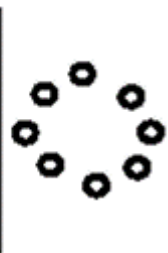
15. Circle & tilted square



16. Vertical diamond



17. Tilted triangles



18. 8-dot circle



19. Wertheimer's Hexagons



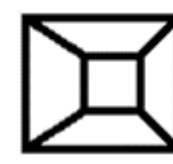
20. Horizontal diamond



21. 3-D rings



22. Necker cube



23. Tapered box

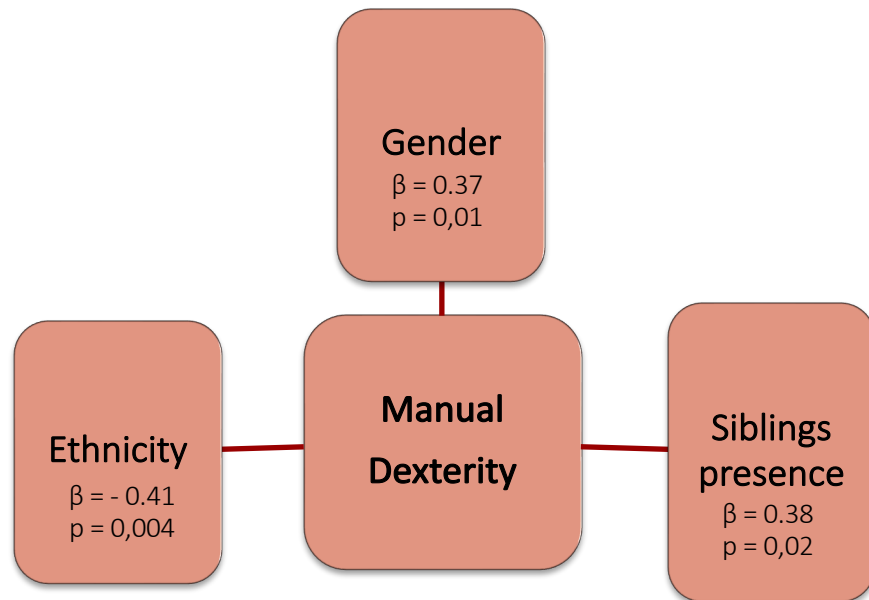


24. 3-D Star

A2: the same as A1
the comparison
matched h

RESULTS: B and C

- **Child's characteristics:** males with lower fine motor performances (Morley et al. 2015).
- **Family's characteristics:** important the contextual stimulation (Giannini, & Pittau, 2013).



Hierarchical regression
 $R^2 = 0,38$; $F(39) = 7,55$; $p = 0,01$

C1: Use of technological devices influences negatively the fine motor competencies (Sulzenbruck et al., 2011).

Descriptive statistics

	Mean	SD	Min	Max
Tablet	84.05	77.7	0	240
Computer	50.60	64.84	0	240
Smart-phone	19.37	31.89	0	150

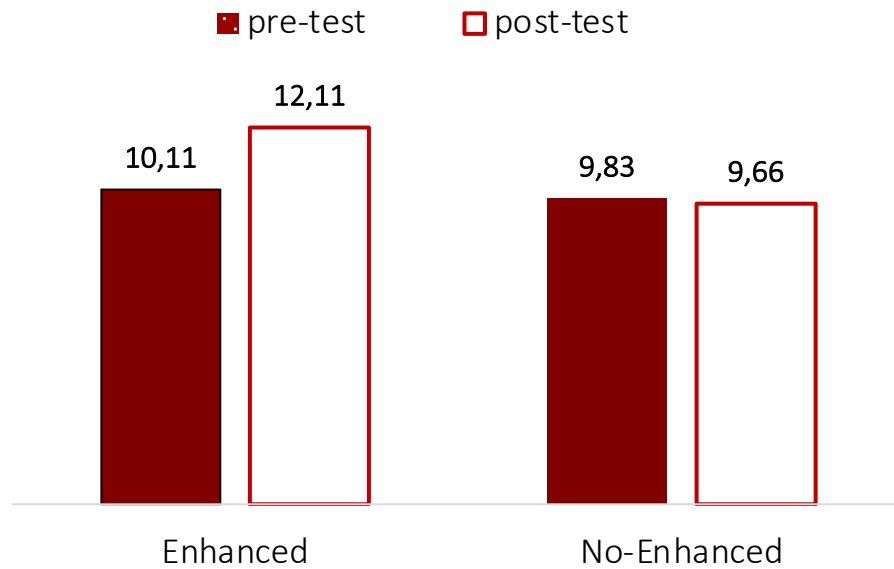
Spearman's' correlations

		Tablet use in minutes	PC use in minutes
MOV	rho	-.403*	-.381*
	p	.016	.024
VMI	rho	-.343*	-.204
	p	.044	.239

RESULTS: D

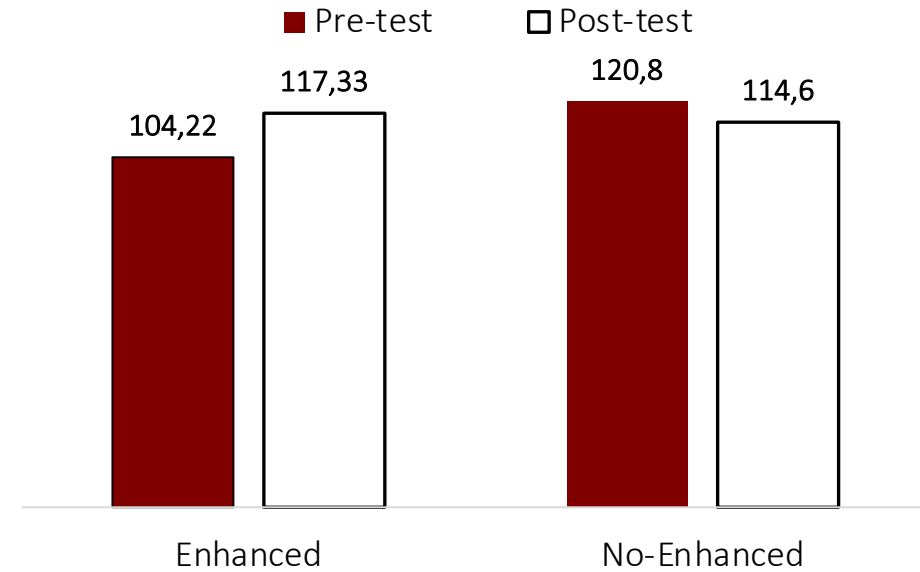
D1: positive effect of the enhancement on the improvement of fine motor skills
(Tanner et al., 2015).

ABC Movement scores



	F	df	p	np ²	β
Time	4.51	1	.053	.258	.503
Time*Enhancement	6.31*	1	.026	.327	.642

VMI scores



	F	df	p	np ²	β
Time	2.86	1	.116	.193	.344
Time*Enhancement	22.83*	1	<.001	.655	.992

CONCLUSIONS

1. Children with pediatric cancer showed worse performance in VMI tasks comparing with healthy peers and with norms

2. Males, non-Caucasian and without siblings were more at risk for motor functioning

In this study:

3. The longer use of tablet in children was associated with worse performances in the manual dexterity tests and in VMI tasks

4. Targeted and timely intervention could ameliorate manual dexterity scores in pediatric patients



DISCUSSION

LIMITS

- Reduced sample
- No involvement of children who underwent HSCT
- Different settings for enhancing activities

FUTURE RECOMMENDATIONS

- To involve more regularly all patients in the fine motor training phase
- To investigate further characteristics of the child in more detail through direct interviews with the parents and the involvement of other health professionals
- Longitudinal approach
- To involve other centers to increase the number of participants.
- Specific motor psycho-educative programs should be implemented for the pediatric patients more at risk.

CLINICAL IMPLICATIONS

- Difficulties in visual-motor integration or in manual dexterity could impact on writing capacities.
- This difficult performance could influence self-esteem and learning in the delicate phase of coming back to school.
- Research has established a connection between fine motor skills and academic performance (Grissmer et al., 2010; Son & Meisels, 2006; Cameron et al., 2012).
- It is important to enhance these fine motor skills for children's short and long term adaptation to their daily activities





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