

Playing to improve spatial organization in the Williams syndrome population

Berney, S., Linh Quang, S., Szilas, N., Barisnikov, K., & Heiz, J.

Introduction

Numerous games were developed during these last decades to help and support skills education for children with special needs. People with Williams Syndrome, who encounter particular learning difficulties in drawing, writing and geometry, seem to have been forgotten by game developers.

The game "Playing with Space", currently being developed, aims at helping the player to improve his specific spatial skills associated with drawing and graphic-motor activities. This game allows the player to train precise visuospatial geometric forms by hand drawing, with increasing levels of complexity.

WS and spatial difficulties

Williams syndrome (WS) is a rare genetic neurodevelopmental disorder characterized by an important dissociation between well-developed general language abilities (Bellugi, Wang, & Jernigan, 1994) and severe deficits in visuospatial abilities (e.g. Bellugi, Lichtenberger, Jones, Lai, & St George, 2000).

Number of studies used the developmental test of Visual Motor Integration (VMI, Beery, Buktenica & Beery, 1997) and highlighted specific visual-construction deficits in copy of geometric forms (Bertrand et al., 1997; Dykens, Rosner, & Ly, 2001; Heiz & Barisnikov, 2016)

The VMI consists of three subtests to distinguish i) visual perception, ii) motor coordination, and iii) visual-motor integration abilities.

Playing with Space

The main objectif of "Playing with Space" is to train the player to draw simple geometric forms, based on the VMI visual-motor integration ability subtest.

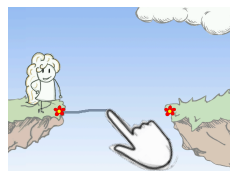
By hand drawing correct simple forms on a touch screen, the player will be able to make his character move around and progress through various levels.

Selected references

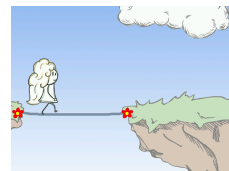
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Game mechanics

• Movements



Hand drawing a simple form : here a horizontal line



Correct production: the character can move around and the player receives a positive audio feedback

• Unlock new colors



Hand drawing precise form to unlock the chest and discover a new color

• Wrong answers

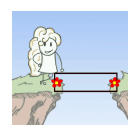
When the player produces an incorrect drawing, he receives a negative audio feedback and help is provided.



After 2 wrong attempts, a hand drawing the desired form appears.



After 4 wrong attempts, points appear to guide the trace.

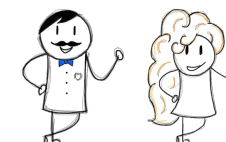


After 6 wrong attempts, a guiding frame appears.

Technical solution

- A platform game for touch screen interface (LENOVO Yoga) developed with the authoring tool Clkteam Fusion 2.5
- 8 levels of difficulty, consisting of the variation of the distance and the height of the platforms, and the complexity of the form to be drawn according to the VMI visual-motor integration ability subtest
- A fictional world and a narration

Choice of avatars



Giving the choice aims at enhancing intrinsic motivation through identification (Malone & Lepper, 1987).

Graphic design follows the metaphor of the drawing to foster integration (Szilas & Acosta, 2011).

Saving data

- Participants' game performances are recorded and transcribed in a spreadsheet for analysis.
- Each gesture production, each trace is also saved as an image file for further analysis

Perspectives

- This game is part of a larger set of several games being designed to support and train the graphic-motor activities and visuo-spatial skills of WS people, according to the developmental trend of the VMI geometric forms (Berry & Berry, 2004).
- WS participants as well as typical development children will play the game and be tested in order to investigate potential transfer on the VMI.

Contact information

Sandra Berney •FAPSE – UPCNE •sandra.berney@unige.ch

Julie Heiz •FAPSE – UPCNE •julie.heiz@unige.ch