Enhancing kindergarteners at-risk arithmetical level through not-intensive computerized interventions.

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About 87% of the children with math disabilities in grade 2 can be correctly diagnosed in kindergarten by a combination of counting and magnitude tasks. Therefore a computer assisted Intervention (CAI) was developed to stimulate the 'early numerical' or 'preparatory' skills of young children.

RESEARCH QUESTIONS

Are CAI (counting and number comparison condition) capable of improving the early numerical skills in kindergarten and arithmetic achievement .
What potential do CAI have on kindergartners with below average performance (< pc 25) in early calculation measures.

METHODS

Number estimation and early calculation skills (with the Tedi-Math, TM) were tested before the intervention. After the intervention in kindergarten calculation was tested again with the TM. In addition number knowledge (NK) and mental arithmetic (MA) was tested in grade 1 (follow-up test).
Children were randomly assigned to the number comparison CAI, the counting CAI or to a control condition. The groups did not differ on intelligence and early calculation before the interventions in kindergarten.

	Controle n=49	Tellen n=44	Vgl n= 39	F (2,129)=
Leeftijd (maanden)	67.67 (4.05)	68.50 (3.83)	68.23 (3.96)	0.58
SES V	37.74 (10.18)	34.48 (12.56)	38.21 (11.19)	1.06
SES M	38.55 (11.08)	38.67 (11.29)	41.18 (10.58)	.01
Proc. Counting	6.31 (1.58)	6.30 (1.74)	6.49 (1.71)	0.17
Conc. Counting	9.98 (3.07)	9.75 (3.38)	10.41 (2.31)	0.52
Rekenen Kleuters	7.39 (5.16)	7.55 (5.55)	7.64 (4.94)	.03

RESULTS

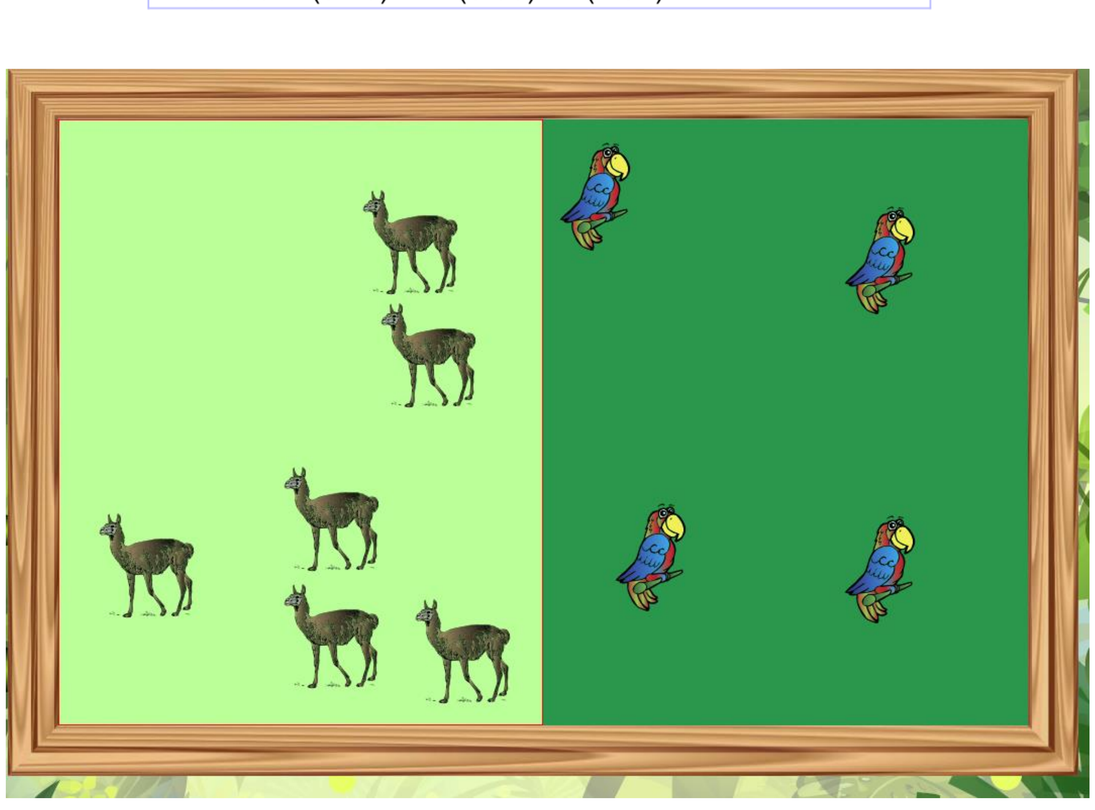
Table 1. *Effects of computer games on children with additional educational needs*

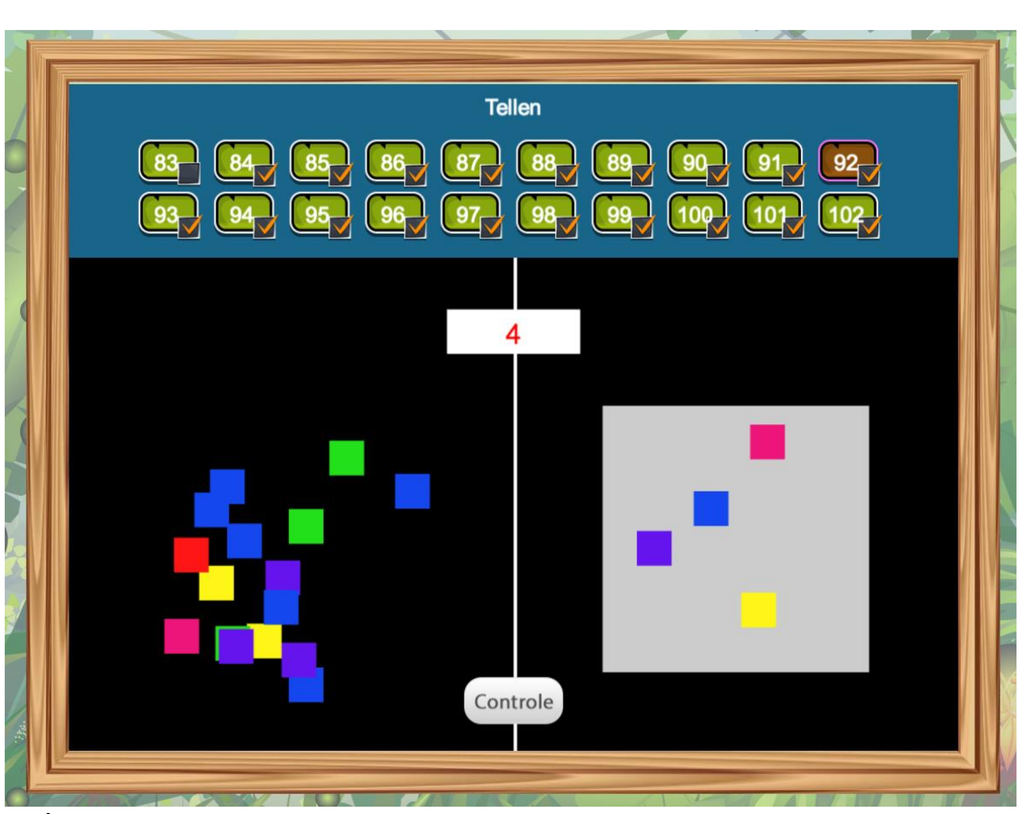
		Counting games		Comparison games		Control group	
		At-risk	Not at-risk	At-risk	Not at-risk	At risk	Not at-risk
		M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Pretest	TM	2.36 (1.50)	10.17 (4.76)	2.50 (1.51)	9.41 (4.44)	2.31 (1.49)	9.85 (4.46)
Posttest	TM	11.23 (2.85)	13.82 (2.16)	9.67 (3.42)	11.27 (2.96)	6.04 (3.20)	9.76 (2.97)
Follow-up	NK	21.62 (4.29)	23.00 (4.28)	19.80 (4.69)	23.25 (4.00)	15.23 (5.59)	20.79 (5.37)
	MA	21.00 (5.05)	22.87 (4.93)	18.70 (4.30)	21.36 (5.65)	14.46 (5.41)	19.55 (6.54)

$p \leq .05$, TM = Tedi-Math; NK = number knowledge; MA = mental arithmetic; At-risk = having 'additional educational needs' for mathematics difficulties in kindergarten

CONCLUSIONS

Both CAI had a sustained effect on arithmetic which was noticeable in the follow-up tests in grade 1. Children in both experimental CAI performed better than the control group. In addition, the counting CAI had better mental arithmetic skills than the comparison and control groups. The findings demonstrate that digital technology present new opportunities for learning and exploring early numerical concepts and sharpened the actual learning process in young children. CAI in pre-school was able to enhance early numeracy in young children with a delayed effect on arithmetic performances in grade 1. Waiting till grade 1 to intervene, when arithmetic difficulties become persistent, seems a waste of valuable (instruction) time.





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