

Scaffolding depth cues and perceptual learning in VR to train stereovision: A proof of concept pilot study.

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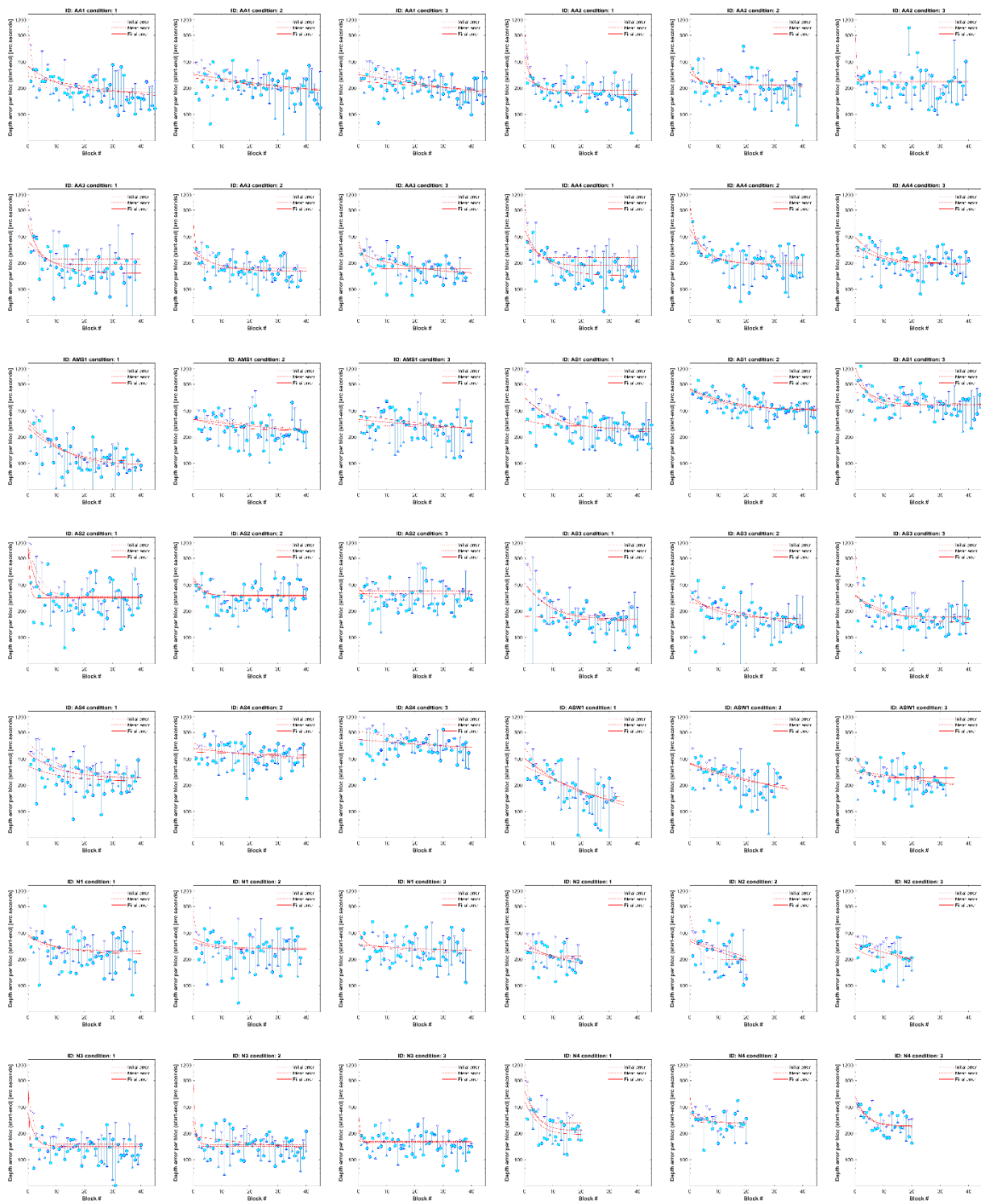
SUPPLEMENTARY MATERIAL

Table S1

Participant clinical details.

SID	Age, Gender	Dx	Visual acuity	Ocular alignment	Refractive error	Fixation
AA1	24, M	Aniso	OD: 20/16 OS: 20/25 +1	Far: ortho Near: 4 EP	OD: +1.25 -1.00 x002 OS: +4.25 -1.50 x170	Central
AA2	18, F	Aniso	OD: 20/25 -1 OS: 20/20 +1	Far: ortho Near: ortho	OD: +1.25 -1.25 x188 OS: +0.25 -0.25 x009	Central
AA3	25, F	Aniso	OD: 20/20 +1 OS: 20/16	Far: 4 EP Near: 5 EP	OD: +3.00 OS: plano OD: +7.75 -2.25 x085 (add 2.25)	Central
AA4*	62, M	Aniso	OD: 20/40 -2 OS: 20/20 -1	Far: ortho Near: ortho	OS: +5.25 -1.50 x105 (add 2.25)	Central
AMS1*	21, M	Strab	OD: 20/25 -2 OS: 20/50 -2	Far: ortho Near: ortho	OD: +5.50 -4.75 x008 OS: +5.75 -5.00 x172	Central
AS1	36, F	Strab	OD: 20/20 OS: 20/20 -1	Far: 4 RET Near: 4 RET	OD: -0.50 DS OS: -0.25 DS	Central
AS2	30, F	Strab	OD: 20/20 -1 OS: 20/20 -1	Far: 2 LET Near: 4 LET	OD: +3.25 -1.25 x170 OS: +3.50 -1.25 x010	Central
AS3	20, M	Strab	OD: 20/20 -2 OS: 20/20 -1	Far: trace XP Near: 6 XP	OD: +0.50 -0.50 x180 OS: plano -1.00 x180	Central
AS4	54, M	Strab	OD: 20/25 -1 OS: 20/20 -1	Far: 14 RET 5 HoT Near: 6 LET 10HyT	OD: -1.00 -0.75 x160 OS: -1.00 -1.00 x020	Central
ASW1	22, F	Normal	OD: 20/20 +1 OS: 20/16 -2	Far: trace XP Near: 2 XP	OD: -4.25 -1.00 x180 OS: -4.00 -0.75 x160	Central
N1	25, F	Normal	OD: 20/16 -1 OS: 20/16 -1	Far: ortho Near: ortho	OD: -3.75 -0.75 x174 OS: -4.25 -0.50 x003	Central
N2	26, F	Normal	OD: 20/20 OS: 20/20	Far: ortho Near: ortho	OD: -6.25 -0.25 x085 OS: -6.25 -0.25 x085	Central
N3	28, M	Normal	OD: 20/20 -2 OS: 20/20	Far: ortho Near: ortho	OD: plano OS: plano	Central
N4	24, F	Normal	OD: 20/25 +1 OS: 20/25 +2	Far: ortho Near: 2XP	OD: plano OS: plano	Central
N5	28, F	Normal	OD: 20/20 +2 OS: 20/20 +2	Far: ortho Near: ortho	OD: -0.50 -2.25 x107 OS: -0.50 -2.25 x078	Central
N6	23, F	Normal	OD: 20/16 -2 OS: 20/16 -1	Far: trace XP Near: 3 XP	OD: -3.25 OS: -3	Central
N7	23, F	Normal	OD: 20/20 +2 OS: 20/20	Far: trace XP Near: 3 XP	OD: +0.25 -1.50 x177 OS: +0.25 -1.25 x176	Central
N8	24, F	Normal	OD: 20/20 -1 OS: 20/20	Far: 2 XP Near: 6 XP	OD: -5.25 OS: -7.5	Central
N9	23, F	Normal	OD: 20/16 -1 OS: 20/16	Far: ortho Near: 4 EP	OD: -1.00 DS OS: -1.00 DS	Central
N10	24, F	Normal	OD: 20/16 OS: 20/12.5	Far: ortho Near: ortho	OD: -1.75 DS OS: -1.75 DS	Central

AA = Participants with anisometropia (n = 4); AMS = Micro-strabismic participant (n = 1); AS = Participants with strabismus (n = 4); ASW = Stereo-weak participant with otherwise normal binocular vision (n = 1); N = Stereo-normal participants (n = 10); * = participants with amblyopia.



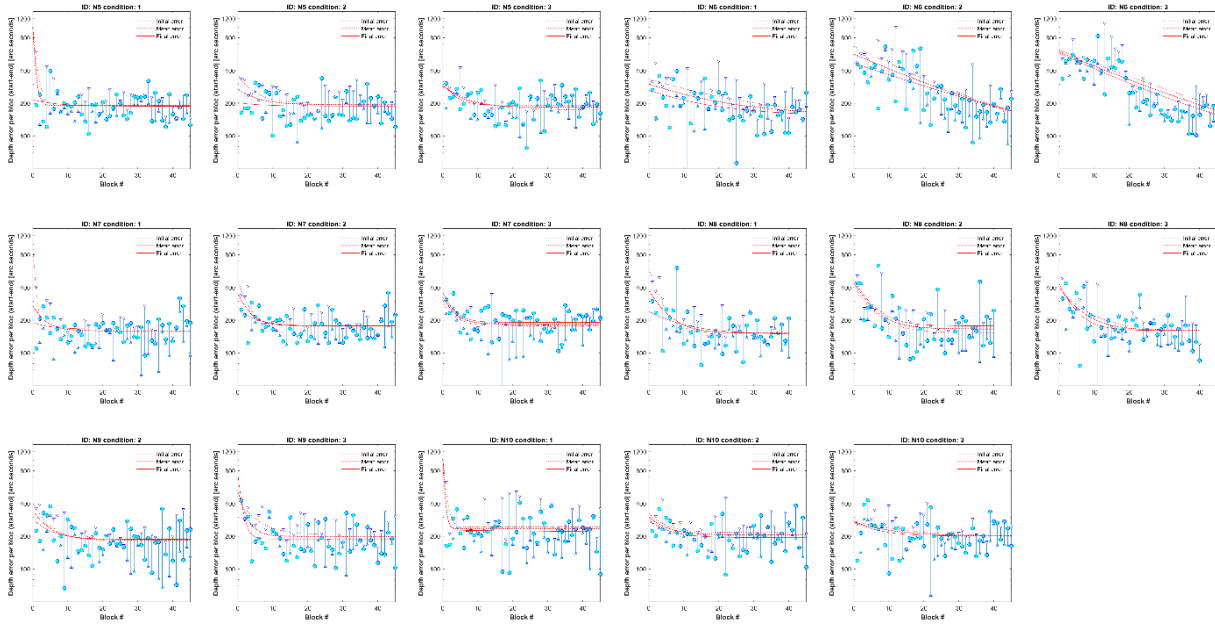
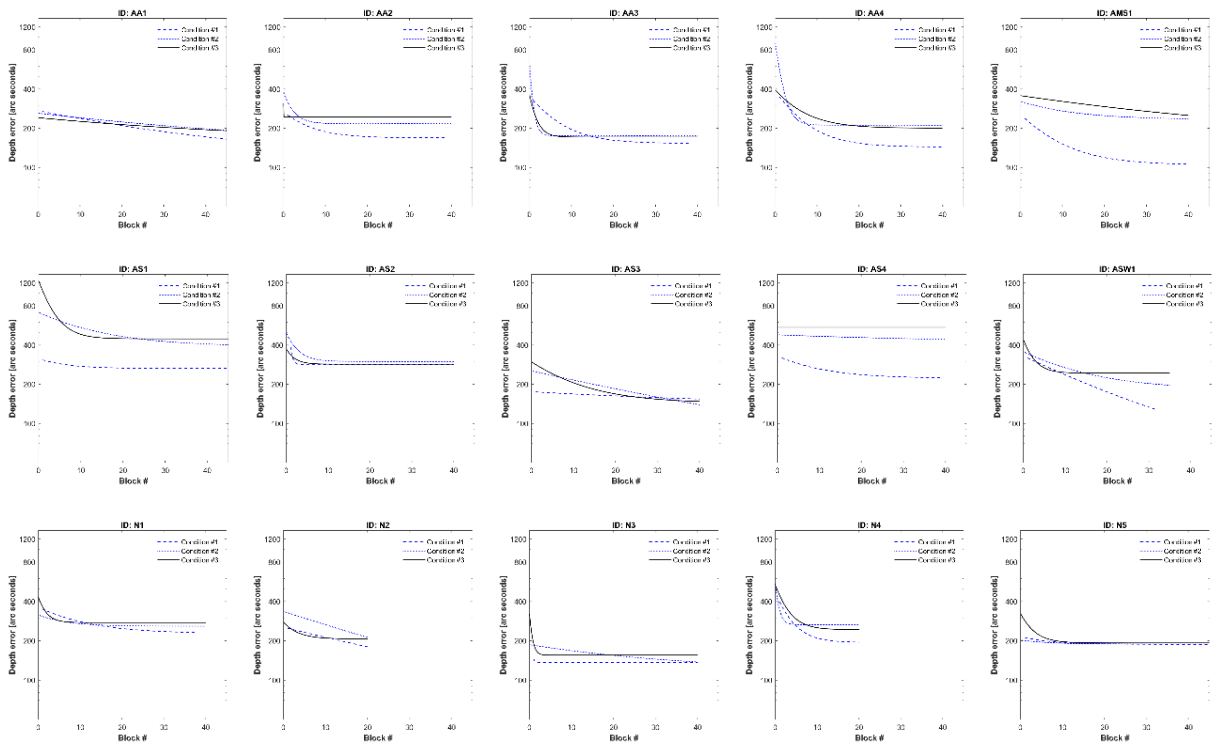


Figure S1. Across-block learning for each participant and condition. Each block is represented as a vertical line, with a triangle on one end indicating the depth error at the beginning of the block and a circle indicating the depth error at the end of the block. The fits represent an exponential function to the initial error at each block (dotted line), mean error (hashed line), and final error (continuous line).



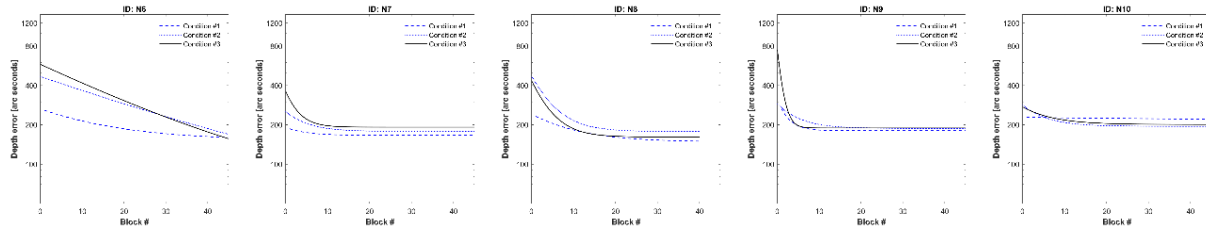


Figure S2. Across-block learning for all participants. Each graph shows the exponential fit of the end-block depth error in the three conditions: Condition 1, blue dashed line; Condition 2, blue dotted line; Condition 3, dark continuous line.

Table S2

DartBoard in-game accuracy of a normal sighted participant in two scenarios: binocular vision (BV) and monocular vision (MV) by means of a physical patch. Time of game play 15 minutes in both cases. Condition (Level 1, 2 and 3); total number of trials; percentage of successful hits towards de board; median accuracy and interquartile range (seconds of arc); dichoptic task errors (per 100 trials)

Condition	Trials		Hits (per 100 trials)		Accuracy (arc secs)		Dichoptic errors	
	BV	MV	BV	MV	BV	MV	BV	MV
1	23	14	100	78.6	201 [106 – 333]	583 [308 – 753]	0	14
2	22	19	100	84.2	251 [157 – 396]	566 [402 – 915]	0	26
3	24	19	100	63.2	165 [56 – 331]	363 [230 – 860]	42	53

Table S3

Halloween in-game accuracy of a normal sighted participant in two scenarios: binocular vision (BV) and monocular vision by means of a physical patch (MV). Time of game play 15 minutes in both cases. Condition (level 1, 2 and 3); total number of trials; successful trials (per 100 trials); dichoptic task errors (per 100 trials)

		Trials			Successful trials (per 100 trials)			Dichoptic errors (per 100 trials)		
		Cond 1	Cond 2	Cond 3	Cond 1	Cond 2	Cond 3	Cond 1	Cond 2	Cond 3
		Overall	BV	146	141	133	92	89	86	2
	MV	133	136	118	77	61	65	10	10	12
1000"	BV	18	18	18	100	100	100	0	0	0
	MV	18	22	26	100	82	69	0	0	0
650"	BV	18	20	19	100	90	95	0	5	5
	MV	19	114	44	95	57	70	5	12	18
420"	BV	19	18	22	95	100	77	5	0	14
	MV	21		48	86		58	10		13
270"	BV	24	27	25	100	89	96	0	0	0

	MV	33			73			9		
180"	BV	25	27	26	96	85	92	4	0	0
	MV	42			60			17		
120"	BV	31	31	23	77	77	61	3	0	0
	MV									
80"	BV	11			82			0		
	MV									

Table S4

d' PPR for each participant, cue scaffolding level, and stereoacuity demand.

SID	Condition 1				Condition 2				Condition 3			
	1000"	800"	600"	400"	1000"	800"	600"	400"	1000"	800"	600"	400"
AA1	1	1.28	1.07	0.93	0.84	1.1	1.29	1.29	1	1.01	1.11	0.93
AA2	1.15	1.11	1.18	1.45	1.11	1.11	1.02	1.5	0.8	1.25	1.63	2.05
AA3	0.99	1.10	1.17	1.29	1	1.06	1.18	0.91	0.99	1.12	1.24	1.22
AA4	0.99	2.37	1.55	1.49	0.99	2.06	1.83	1.3	1	1.53	1.63	0.77
AMS1	1	1.48	0.97	1.08	1	1.18	1.22	1.1	1	1.37	1.36	1.16
AS1	1	1.71	1.42	1.77	1.59	1.4	1.5	1.7	1.6	1.3	2	0.76
AS2	0.9	3.65	2.63	1.91	1	3.04	2.43	1.1	1.08	3.07	2.92	1.18
AS3	1	1.04	1.03	1.34	0.76	0.9	0.96	1.19	0.76	0.88	0.89	1
AS4	1	1.45	1.45	-	2.28	1.79	-	-	1.35	1.53	0.38	-
ASW1	1.01	1.15	1.14	1.18	1.2	1.2	0.97	1.1	1.12	1.1	1.16	0.88
N1	0.9	1.11	1.12	1.1	1.01	0.87	1.15	1.2	0.94	0.74	1.12	1.22
N2	1.01	1.4	1.4	1.05	1	1.19	1.38	1.46	1.06	1.27	1.31	0.95
N3	-	1.03	0.98	1.09	-	0.66	1.06	0.85	-	0.76	0.91	1.17
N4	1.12	1.4	1.36	1.35	1.25	1.45	1.28	2.2	1.07	1.2	1.5	0.54
N5	1	0.98	1.24	1.13	1	0.92	1.2	0.97	1	1.05	1.23	1.02
N6	1	1.05	1.04	0.88	1	1.02	1.22	1.37	1	1.17	1.27	1.31
N7	0.9	0.85	1.17	1	0.74	0.75	0.87	1.08	0.63	0.7	0.84	0.82
N8	1.06	1.33	1.43	0.83	1.22	1.14	1.13	1.27	1.22	0.95	1.26	1.64
N9	-	0.92	1.75	1.29	-	0.99	1.01	1	-	0.73	1.05	1.19
N10	1	0.93	1.11	1.53	1.01	0.85	1.07	1.06	1.01	0.92	1.07	1.02

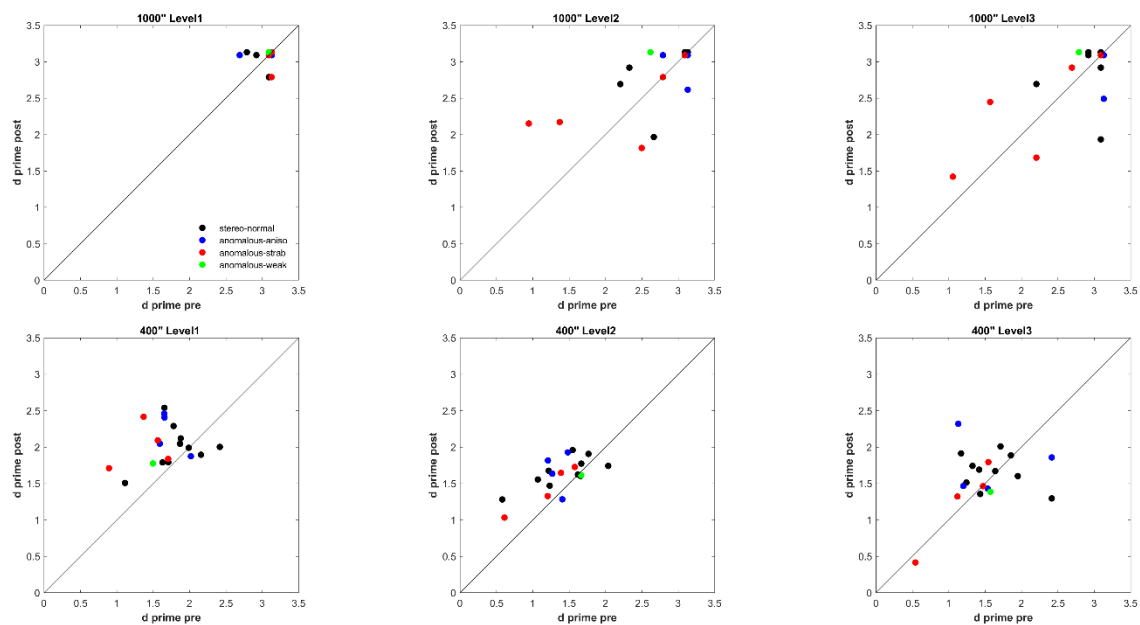


Figure S3. Halloween game pre post d' values for stereo demand of 1000'' and 400'' at each condition (level 1, 2 and 3). Symbols represent a different participant and group: anisometropia (blue), strabismus (red), stereo-weak (green), and normal binocular (grey). Points above the unity line indicate an improvement in accuracy in the first three hours compared to the last three hours of game play.