

T - O -Bs P s f R s h B
I - Os -Bs F D s

J s O f , K h C s , R X C f , R P h
S h f S B h S s , S U s ,

I (h s s s h s s - s s -
s h h' s s - s s . T f s s s h h
s - s s , f - s f (s h f h s
h h f h s f . T f s s s
s s , s h - s f f h f f s s s
f s . D s s s h s s h s f s
. I S (1 , s - s s s X , 1.5 h f -
- s s . s s s f i s s s h
s f s h s h s s h s s ,
h s f (s s s h - s h s h - s
h s f s . I S s 2 3 , f h h - s
(S (2 : s ; S (3 : s s) . s h s f h s
s h s f s h - s s s f i (s s
h h h' h h - h s - s s . T f -
s h h s h - s s s s h s) . h

Keywords: f , - , (,) , s , s

Os (f s " f h -
f f s s s h s) s h h h
s h f h h s
h h' h . I (s)

T... (2016). F...
s... h... f... s... xh
s... f... h... s... h
s... f... h... s... h
f... s... f... A... h... f... s... f...
s... s... s... s... f... s... f... s...
(A & C... s, 2011; C... s, 1932; E... h... s...
2003; G... s, 2017; S... s, 1984; V... , 1999). T...
f... s... h... s... h... s... s... f... h...
fi... s... s... s... h... s... s... h... fi...
T... fi... f... s... s... h... s... s... s...
(- s... f... f... h... s... s... s...
h... h... s... h... s... h... s... f... s... s...
h... s... s... s... (H... s... , 2017; M...
h... s... & A... s, 2008; G... s, 2015). H...
f... s... s... f... s... f... h...
f... s... s... h... s... f... s... h... h...
A... s... s... s... s... s... s...
s... s... s... T... h... ff... s... h... s... s...
s... s... h... h... s... C... h... h... s... f...
s... s... h... s... s... s... f... s... f... h... s...
s... h... s... s... (f... s... f... h... s...
s... h... s... s... s... s... T... h... f... s... s...
s... h... s... : fis... f... s... fi... s... f... f...
s... s... s... s... s... s... s... f...
s... h... s... s... s... B... h... s... f...
s... s... h... f... s... T... h... s... s... s...
s... h... h... h... s... s... h... h...
f... h... h... s... s... s... s...
I... h... s... h... s... f... h... s... s... s... f...
f... h... s... s... s... s... s... s...
s... T... h... s... s... h... s... s... h... h...
h... s... f... s... s... s...
h... s... f... s... h... s...
s... h... f... s... s... h... s...
s... s... f... h... s... h... f... s... h... h...
F... h... s... s... s... s... h... s... s... s... f... h...
s... s... s... h... s... s... s... s... s... s...
h... s... s... s... s... s... s... f...
s... s... s... s... s... s... s... s...
H... s... s... s... f... h... s... s... s...
h... s... s... h... s... s... f... h... s... s...
s... s... s... s... s... s... s... E...

f... s... f... h... s... s... f... h... s... h... h...
T... h... f... s... s... h... h... f... s... h... s... f...
s... s... f... h... f... s... s... s... h... s...
s... s... s... h... f... s... s... h...
s... T... h... s... s... (h... h...),
h... s... s... h... h... s... f... h... s...
s... h... h... h... f... s... - s... f... s...
s... , 10... s... f... h... s... - s...
s... T... h... s... h... s... s... f... h...
h... s... s... h... s... s... f... O... h... s...
h... s... s... s... h... s... s... s...
s... s... s... f... h... s... s... O... h... f...
h... h... s... h... s... h... (STM) f...
h... s... s... f... s... h... s... s... h... h...
s... T... s... f... h... s... s... h... h...
s... f... h... h... f... s... s... h... h...
s... h... s... s... f... h... h... f... s... 1.5-...
s... h... h... s... s... s... s... s... s... If... h...
s... s... s... s... s... s... s... s... f...
s... f... h... s... s... s... s... s... f...
h... h... s... s... h... s... s... h... s... s...
h... h... s... s... s... I... s... s... f... h... s... s...
STM... s... s... h... s... f... h... s... s...
1.5-... h... h... s... f... h... s... f...
s... s... s... s... f... f... h... s... s...
s... h... h... s... s... s... s... s...
h... h... s... s... s... s... s... s...
h... T... h... h... s... s... s... s...
T... h... s... s... f... h... s... s... s... s...
s... fi... f... h... s... h... I... M... s... A... s...
(2008); s... s... s... s... h... s... s...
s... s... h... s... s... s... H... s... s...
s... s... s... s... T... s... h... s...
s... s... h... 68% (, 49) f... h... s...
32% (, 23) f... h... s... s... s...
s... s... F... h... f... s...
h... s... h... f... s... h... s... s... h... h...
s... s... s... s... s... h... s... s... h...
f... .30 .46, h... s... f... h... h...
s... h... s... fi... h... s... s... p-... s... f... .08
s... .07 h... f... h... s... s... f... .26 .28. I...
s... ff... h... f... s... s... s... s...
s... fi... (p-... s... f... .20 .79). T... h... s...
f... s... f... .06 .28, h... s...

ss (f s s f b ff -
x) f fi (s b s ss b
b b s s s), b' s b s ss
b - s s s fi b -
fi b f s s s b b s - s
f b s b (s b f s -
f b s b b f b
f T f b b b
f ff s b f s -
s s b b s b s
S s 2 3 s f s -
fi b f s s . I S , 2, f f s b b
T f b b' f s s b b S
f b b x b s s b S
3 s s f b b f b b s s -
s (90 s s b). If b s s b s -
fi , b s b b - s s
- s s b b b b s . I s , f b
s b s b - s - s s
s - s s fi , b b b -
b s - s s .
F (f b b b f s f b s s f) b
s s b f s s s s b s s f
S fi , ss b s s , ss ss b b b s -
f s - s s s s s s s s
s s (s s s s b f s s s s -
s s s s s f b f s s

f b (b b b s x (f).
 F b , s s b b s f)
 f b (b f b (. P b s
 b b' b 15-
 s s . F , s s b b' 15-
 M . Af (s s b s s b 15-
 ss , s b s . Af b -
 s , b P b' 1 Sss
 P s (1.5 b -
 P b' 2. E b f s s (ss
 f b f s s b M s s .
 T b Ts b b s f b f s s
 , f b s s . T b' s
 x (f b f s f b' s
 f s s f b . F b , b' s b
 b' s x b f . A b b' s
 b s b 15- . A b b P b' 1 s ,
 O (s s b s s ss , -
 s b f s . Af b s ,
 s b

• = b b f b b s s b s
 f b b b b b f b

Mea e fD a gPe f a ce

P f b s s ss ss s s -
 s b a fi b f s s s
 s b s f f s . T b s
 s s F 2 F b , s s s ,
 A—G, s :
 • A = b b f b b : s s b s
 f b f b b b b b .
 • = b b f b f : s s b f s
 z b b b b b s f b b -
 • = b b f ss b b b s f b s .
 b f s : s s b f s
 b b b b b b b s .

A c a A a e

T s s s s h h h s f s - s
 s s s s s h h h s s s , f -
 j s (G f ,
 , 2014; G f , , 2015). F s , f h SSR, f -
 s s h SSR h f
 h f 1.00 h SSR h f . H ,
 . A f s

Study 1: Spatial Relation Ratio (SSR) Values of the Four Drawing Models; M, Standard Deviation & 95% Confidence Intervals of the M of the SRR Values for the Observation-Based and Imagination-Based Drawings; M, Standard Deviation and 95% Confidence Intervals of the Means for the Observation-Based Drawing Errors; Results of Inferential Tests Assessing for Systematic Biases in Observation-Based Drawing Errors

M	s	s (SSR)								
		B/	C/	D/	A/E	F/E	G/E	(D-B)/	(C-B)/	(D-C)/
M 1 (n = 12)										
M V		.46	.68	.81	1.63	.25	.27	.36	.22	.13
O.D. M (SD)		0.45 (.06)	0.67 (.04)	0.83 (.02)	1.50 (.17)	0.24 (.05)	0.23 (.03)	0.38 (.05)	0.22 (.03)	0.16 (.04)
95% CI f O.D. M		.41, .48	.64, .69	.81, .84	1.40, 1.61	.21, .27	.21, .25	.35, .41	.20, .24	.14, .19
I.D. M (SD)		.41 (.07)	.64 (.06)	.81 (.04)	1.34 (.12)	.22 (.08)	.17 (.06)	.40 (.07)	.23 (.04)	.17 (.05)
95% CI f I.D. M		.36, .46	.60, .68	.79, .83	1.27, 1.42	.17, .27	.13, .21	.36, .44	.21, .25	.14, .20
M 2 (n = 11)										
M V		.47	.66	.85	1.66	.30	.38	.39	.19	.19
O.D. M (SD)		.42 (.04)	.64 (.03)	.84 (.03)	1.49 (.13)	.23 (.08)	.27 (.07)	.42 (.03)	.21 (.04)	.20 (.02)
95% CI f O.D. M		.40, .45	.62, .66	.82, .86	1.40, 1.58	.18, .29	.23, .32	.39, .44	.19, .24	.19, .22
I.D. M (SD)		.40 (.03)	.62 (.05)	.81 (.04)	1.35 (.20)	.19 (.04)	.16 (.05)	.40 (.04)	.22 (.04)	.19 (.04)
95% CI f I.D. M		.38, .43	.58, .66	.78, .83	1.22, 1.48	.16, .22	.13, .19	.38, .43	.19, .24	.16, .22
M 3 (n = 13)										
M V		.46	.66	.83	1.78	.28	.31	.37	.20	.17
O.D. M (SD)		.43 (.04)	.65 (.04)	.83 (.02)	1.58 (.16)	.27 (.05)	.26 (.06)	.40 (.04)	.22 (.04)	.18 (.03)
95% CI f O.D. M		.41, .45	.62, .67	.81, .84	1.48, 1.67	.24, .30	.22, .29	.38, .43	.20, .24	.16, .20
I.D. M (SD)		.45 (.07)	.66 (.04)	.83 (.05)	1.32 (.11)	.22 (.09)	.18 (.06)	.38 (.03)	.21 (.04)	.17 (.03)
95% CI f I.D. M		.41, .49	.63, .69	.80, .85	1.25, 1.39	.16, .27	.15, .21	.36, .40	.19, .24	.15, .18
M 4 (n = 13)										
M V		.47	.68	.85	1.54	.27	.28	.38	.21	.17
O.D. M (SD)		.44 (.04)	.65 (.03)	.85 (.04)	1.40 (.13)	.25 (.08)	.24 (.04)	.41 (.06)	.20 (.04)	.20 (.03)
95% CI f O.D. M		.42, .47	.63, .66	.83, .87	1.32, 1.48	.20, .29	.22, .26	.37, .44	.18, .23	.18, .22
I.D. M (SD)		.41 (.08)	.63 (.06)	.82 (.04)	1.36 (.14)	.23 (.07)	.18 (.06)	.41 (.05)	.22 (.05)	.19 (.04)
95% CI f I.D. M		.37, .46	.60, .67	.79, .84	1.27, 1.44	.19, .28	.14, .22	.38, .44	.19, .25	.16, .21
T (N = 49)										
O.D. E M (SD)		.94 (.10)	.97 (.05)	1.00 (.04)	.90 (.09)	.92 (.24)	.82 (.16)	1.07 (.12)	1.03 (.19)	1.13 (.21)
95% CI f O.D. E M		.92, .97	.96, .99	.99, 1.01	.88, .93	.85, .99	.77, .86	1.04, 1.11	.98, 1.09	1.07, 1.19
t, p (-)		4.06, <.001	3.84, <.001	0.40, .69	7.69, <.001	2.35, .02	8.16, <.001	4.12, <.001	1.18, .24	4.45, <.001
C f s d										

$s = \frac{1}{n} \sum (x_i - \bar{x})^2$ (S = 2)
 $s = \frac{1}{n} \sum (x_i - \bar{x})^2$ (S = 3).
 y2 2
 180
 P ced e
 Pa c a
 S x, f
 s
 f f s s f b s /
 s . T f s, h s s f f b S s s s s h f i f
 56 s (40 f s, 16 s; M (SD) = 20.89 (4.76)
 (s).
 Mae a
 T f s f S 2
 S 1. T f x
 f s h s
 f s - s
 T s f s h s s S 1.
 T f s s s f h s -
 - s T s
 T s h x . P s h

s
 h s - . T h s f s - z f s
 s s b f s b f -
 s h s - - . T h s b s -
 f b s b b' s f s s
 A f b s , s
 f b
 A h s s b s b s b -
 s s S (1 6) h Measures of Drawing Per-
 formance

.423, f_i σ s s s U b s
 s b b $-$ b s $-$
 s s f s $($ s s f_i $-$
 s b $.05$ α f b f f SRB $($ $)$ b b
 $($ s b b $($ f_i b b b $($ s $-$ b s $,$
 f s $-$ $-$ ss s b A s s b $-$
 f $-$ $-$ ss s b A s s b $-$

Study 2: M, Standard Deviation and 95% Confidence Intervals of the Means for the Upright and Upside-Down Observation-Based Drawing Errors; Results of Inferential Tests Assessing Systematic Biases in the Upright and Upside-Down Observation-Based Drawing Directional Errors; Results of Inferential Tests Assessing Significant Differences in Absolute Errors Between the Upright vs. Upside-Down Observation-Based Drawings

U.O.D. 95% CI t, p	D, f (-)	S								
		B/A	C/A	D/A	A/E	F/E	G/E	(D-B)/A	(C-B)/A	(D-C)/A
M (SD)		.95 (.10)	.99 (.07)	1.01 (.04)	.90 (.08)	.85 (.19)	.81 (.14)	1.08 (.12)	1.08 (.15)	1.08 (.22)
U.O.D. E		.92, .98	.97, 1.01	1.00, 1.02	.88, .92	.80, .90	.77, .85	1.04, 1.11	1.04, 1.12	1.02, 1.14
C f		3.60, .001	1.00, .321	1.21, .233	9.78, <.001	6.09, <.001	10.11, <.001	4.70, <.001	3.98, <.001	2.76, .008

1 - 3 3)

1 b

$\frac{s}{SRB} = \frac{s}{h} \cdot \frac{h}{s} \cdot \frac{.05 \alpha}{h} \cdot T \cdot \frac{s}{h} \cdot \frac{.05 \alpha}{h} \cdot \frac{s}{h} \cdot 4$

Study 3: M, Standard Deviation and 95% Confidence Intervals of the Means for the Upright and Sideways Observation-Based Drawing Errors; Results of Inferential Tests Assessing Systematic Biases in the Upright and Sideways Observation-Based Drawing Directional Errors; Results of Inferential Tests Assessing Significant Differences in Absolute Errors Between the Upright vs. Sideways Observation-Based Drawings

	S											
	S	s	s	B/A	C/A	D/A	A/E	F/E	G/E	(D-B)/A	(C-B)/A	(D-C)/A
U.O.D.				.91 (.10)	.96 (.07)	.99 (.05)	.90 (.07)	.89 (.18)	.88 (.14)	1.08 (.11)	1.09 (.17)	1.07 (.17)
95% CI				.88, .94	.95, .98	.97, 1.00	.89, .92	.84, .94	.84, .92	1.05, 1.11	1.04, 1.14	1.03, 1.12
t, p ()				6.56, <.001	3.68, .001	2.11, .039	10.32, <.001	4.54, <.001	6.50, <.001	5.25, <.001	3.87, <.001	3.12, .003
C _f s _d				.89	.50	.29	-280.3(f)	-283.5(M s)	-282.1(f)	TJ-19.46-2.06(98	283.5(M s)	.2(13.5(M
												71283.5(M

s (B/A & F/E), () h s (G/E), () h
 h (A/E) () h s s h
 s - - h (D-B /A), s - - s (C-B /A) s - -
 h (D-C /A) . I h s s s -
 s, h s f s s s (C/A & D/A;
 N x, s f ff s absolute drawing errors
 h f h s s s S / 2 h s
 f T 6 h s s s . T h s s
 I s, s s s h h h f h s (B/A).
 s h h f h s (G/E). A s s
 s h h f h s h (C/A & D/A), h s h f
 h h (A/E), h s (F/E), s s
 s h s h (D-B /A), s s (C-B /A)
 h (D-C /A).

F s, h ss ss h s h h -
 - s s S / 3, s
 S s 1 2. N (, s h ff s
 h h - s s h (h h
 s h h s, s h - h s,
 - s s s - h s (h
 h' s S / 2 (h S / 1), h h h
 s s fi / 5(260)294454 12 (A2-14.))1-142J 4TDT . 8-f34 -2.9165-142409TDT .

() s s b s - b
D h s b f b f b s s s ,
h s f h s s f b s s s f -
s b fi s fi s b s b
s s s f s b

T h s s f b s b f b
ff h s s b f b
ss h b b f
I fi s h b f s
s s s (G f , K) , C h , , 2016)
2017), h s s f h s s s (G f ,
s s s s s f h f s
s s s h s s s . I
s s s s s s s
s s s s s s
f s f s b h s

A , M. L., & C b s , A. (2011). I x s
f s f s s s b s s s . Au-
tism: An International Journal of Research and Practise, 15(4),
457–472. h s :// . /10.1177/1362361310393364
C h , L., H , H. P., & , A. A. (1932). A x
s , f b ff f f s
f . Journal of Experimental Psychology, 15(1), 73–86. h s ://
. /10.1037/ 0072671
C h , R., D , J. E., K , A., H , R., S , J., &
s , J. (2019). A s s s x s s : A
Psychology of Aesthetics, Creativity, and the Arts, 13(1), 58–73. h s ://
. /10.1037/ 0000156
C h x , R., & s , J. (2015). Vs s s s
s f s s s . Acta Psy-
chologica, 161, 185–197. h s :// . /10.1016/ . s , .2015.08.012
C h , R., & s , J. (2016). T h s s f s
s . Neuroscience and Biobehavioral Reviews, 65, 195–207. h s ://
. /10.1016/ . .2016.04.002
C h , D. J. (2005). L f : T h f f j f -
a . Perception & Psychophysics, 67(6),
997–1009. h s :// . /10.3758/ f03193626208160TD(,)T /F31T.7449610TD665