Supplementary Material
Association between Copy Number Variation and Response to
Social Skills Training in Autism Spectrum Disorder
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Contents

Figure S1 . Box-plots showing the baseline measures between the carriers of A) Rare genic copy number variation (CNV), B) Clinically significant CNV and C) Rare genic CNV >500 kb and non-carriers in the active social skills training group (SSGT) (n=105) and the Total Sample (N=207)
Figure S2. Box-plots showing the distribution of the changes in Social Responsiveness Scale (SRS) in carriers of rare genic copy number variants (CNVs) (yes) and non-carriers (no) at post-intervention (SRS pre – SRS post-intervention) and follow-up (SRS pre – SRS follow-up) (A) and stratified by pathogenicity (B) or by size of the CNV (C-E).
Table S1. Comparison Between the Baseline Measures of Included and Excluded Participants within the Social Skills Group Training (SSGT) and 'Standard Care'4
Table S2 . Comparison Between the Complete Primary Outcome Data of Included and Excluded Participants Within the Social Skills Group Training (SSGT) and 'Standard Care'
Table S3. List of rare genic CNVs found in the study individuals (additional file)6
Table S4. Mixed linear model results for the association between rare genic copy number variation (CNV) and the primary outcome measure social responsiveness scale (SRS) in the active social skills group training (SSGT) participants and the total sample for carriers of middle-size (101-500 kb) and small rare genic CNVs (25-100 kb)
Table S5. IQ adjusted mixed linear model results for the association between rare genic copy number variation (CNV) and the primary outcome measure social responsiveness scale (SRS) in the active social skills group training (SSGT) participants and the total sample
Table S6 . Mixed linear model results for the association between copy number variation (CNV) and the secondary outcome measures in the active social skills group training (SSGT) participants and the total sample
Table S7. IQ adjusted mixed linear model results for the association between rare genic copy number variation (CNV) and the secondary outcome measures in the active social skills group training (SSGT) participants and the total sample

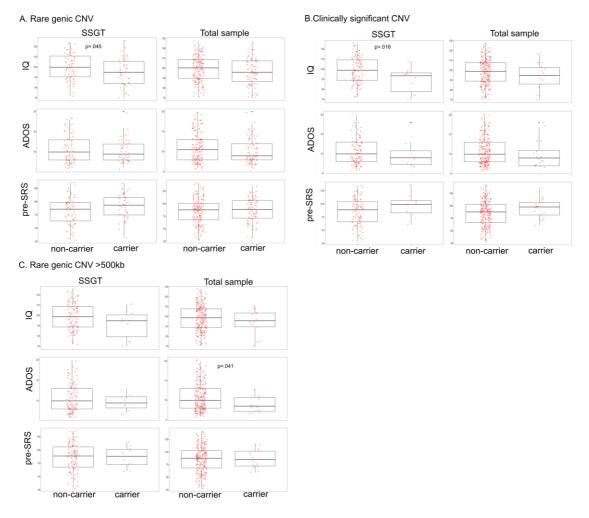


Figure S1. Box-plots showing the baseline measures between the carriers of A) Rare genic copy number variation (CNV), B) Clinically significant CNV and C) Rare genic CNV >500 kb and non-carriers in the active social skills training group (SSGT) (n=105) and the Total Sample (N=207). Social Responsiveness Scale (SRS), Full-Scale IQ, and the Autism Diagnostic Observation Schedule (ADOS) Total Score. *P* values for two-sided Student's T-tests are shown for the significant comparisons.

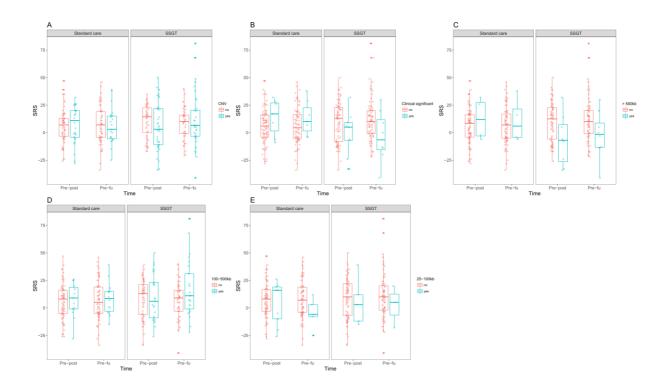


Figure S2. Box-plots showing the distribution of the changes in Social Responsiveness Scale (SRS) in carriers of rare genic copy number variants (CNVs) (yes) and non-carriers (no) at post-intervention (SRS pre – SRS post-intervention) and follow-up (SRS pre – SRS follow-up) (A) and stratified by pathogenicity (B) or by size of the CNV (C-E).

Table S1. Comparison Between the Baseline Measures of Included and Excluded Participants within the Social Skills Group Training (SSGT) and 'Standard Care'

	SSGT							
	Excluded participants due to unavailable saliva sample (n = 44)	Included participants (n = 105)	P value ^a					
Full Scale IQ mean (SD)	93.38 (13.78)	98.49 (13.08)	.038					
ADOS total score	10.76 (4.05)	10.60 (3.31)	.806					
SRS pre-intervention	92.13 (21.81)	86.08 (25.06)	.140					
	Standard care							
	Excluded participants due to unavailable saliva sample (n = 43)	Included participants (n = 102)	P value ^a					
IQ mean (SD)	97.43 (12.96)	98.43 (12.94)	.670					
ADOS total score	11.20 (4.22)	10.95 (3.28)	.704					
SRS pre-intervention	91.41 (26.97)	86.33 (24.30)	.286					

Abbreviations: ADOS, Autism Diagnostic Observation Schedule; SRS, Social Responsiveness Scale. ^a statistical significance was computed using two-tailed Student T-test.

Table S2. Comparison Between the Complete Primary Outcome Data of Included and Excluded Participants Within the Social Skills Group Training (SSGT) and 'Standard Care'

	SSGT								
	Excluded participants due to missing saliva sample (n = 44)	Included participants (n = 105)	P value ^a						
Missing SRS at post- intervention	18	15	<.001						
Post-intervention SRS	26	90							
Missing follow-up SRS	24	19							
Follow-up SRS	20	86	<.001						
	Standard care								
	Excluded participants due to missing saliva sample (n = 43)	Included participants (n = 102)	P value ^a						
Missing SRS at post- intervention	11	6	.002						
Post-intervention SRS	32	96							
Missing follow-up SRS	22	19							
Follow-up SRS	21	83	<.001						

Abbreviations: SRS, Social Responsiveness Scale. a Statistical significance was computed using a two-sided $\chi 2$ test.

Table S3. List of rare genic CNVs found in the study individuals (additional file)

Table S4. Mixed linear model results for the association between rare genic copy number variation (CNV) and the primary outcome measure social responsiveness scale (SRS) in the active social skills group training (SSGT) participants and the total sample for carriers of middle-size (101-500 kb) and small rare genic CNVs (25-100 kb).

	SSGT (n=10	05)	Total Sample (N	ole (N=207)	
Mixed Linear Model	β (95% CI) ^{\$}	P value	β (95% CI)	P value	
Carrier of middle size CNV (101-500 kb)					
*SRSpost	-0.77 (-8.8, 7.3)	.85	-2.05 (-11.2, 7.1)	.66	
*SRSfu	-8.69 (-16.8, -0.6)	.038	-3.46 (-12.9, 6.0)	.47	
*SRSpost*SSGT		-	1.32 (-10.6, 13.2)	.83	
*SRSfu*SSGT	-	-	-5.25 (-17.4, 6.9)	.40	
Carrier of small CNV (25-100 kb)					
*SRSpost	2.93 (-13.1, 18.9)	.72	2.32 (-9.2, 13.8)	.69	
*SRSfu	- 0.78 (-20.1, 18.6)	.94	11.00 (-3.2, 25.2)	.13	
*SRSpost*SSGT	-	-	0.93 (-17.9, 19.8)	.92	
*SRSfu*SSGT	-	-	-11.58 (-34.6, 11.4)	.33	

 $^{^{\$}}$ Negative β estimate indicates decrease (symptoms decrease) and positive estimate increase (symptoms increase) of the SRS score from pre-intervention to post-intervention and follow-up for the carriers.

Table S5. IQ adjusted mixed linear model results for the association between rare genic copy number variation (CNV) and the primary outcome measure social responsiveness scale (SRS) in the active social skills group training (SSGT) participants and the total sample.

Scale (SRS) Carrier of a rare genic CNV SSRSpost 5.33 -2.00, 12.65 .16 -1.73 -9.06, 5.60 .64 *SRSfu -2.53 -9.97, 4.94 .51 -0.03 -7.86, 7.80 .99 *SRSpost*SSGT - - - - - -2.44 -12.97, 8.09 .65 *SRSfu*SSGT - - - - -2.44 -12.97, 8.09 .65 *Carrier of a clinically significant CNV *SRSpost 1.29 -7.22, 9.80 .77 -4.20 -9.15, 0.75 .097 *SRSfu 5.60 -3.13, 14.32 .21 -6.03 -11.16, -0.90 .023 *SRSpost*SSGT - - - 17.28 0.24, 34.31 .047 *SRSfu*SSGT - - - 23.51 6.11, 40.91 .008 *SRSfu*SSGT - - - 23.51 6.11, 40.91 .008 *SRSpost 15.08 2.60, 27.56 .019 -6.616 -23.247, 10.015 .44 *SRSfu 13.86 1.36, 26.36 .031 -4.608 -21.281, 12.064 .59 *SRSpost*SSGT - - - 21.676 1.269, 42.082 .038 *SRSfu*SSGT - - - 21.676 1.269, 42.082 .038 *SRSfu*SSGT - - - 1.50 -10.41, 13.41 .81 *SRSfu*SSGT - - - - 5.09 -17.25, 7.08 .41 *SRSfu*SSGT - - - - - - - - - *SRSfu*SSGT - - - - - - - - -		SSGT KONTAKT group				Total sample	
CNV *SRSpost 5.33 -2.00, 12.65 .16 -1.73 -9.06, 5.60 .64 *SRSfot -2.53 -9.97, 4.94 .51 -0.03 -7.86, 7.80 .99 *SRSpost*SSGT - - - 7.09 -2.99, 17.17 .17 *SRSfot*SSGT - - - -2.44 -12.97, 8.09 .65 Carrier of a clinically significant CNV **SRSpost 1.29 -7.22, 9.80 .77 -4.20 -9.15, 0.75 .097 *SRSpost 1.29 -7.22, 9.80 .77 -4.20 -9.15, 0.75 .097 *SRSfut 5.60 -3.13, 14.32 .21 -6.03 -11.16, -0.90 .023 *SRSfut*SSGT - - - 17.28 0.24, 34.31 .047 *SRSpost*SSGT - - - 17.28 0.24, 34.31 .047 *SRSpost 15.08 2.60, 27.56 .019 -6.616 -23.247, 10.015 .44 *SRSpot 13.86 1.36, 26.36		β\$	95% CI	P	β\$	95% CI	Р
*\$R\$fu	Carrier of a rare genic						
**SRSpost*SSGT	*SRSpost	5.33	-2.00, 12.65	.16	-1.73	-9.06, 5.60	.64
*SRSfu*SSGT	*SRSfu	-2.53	-9.97, 4.94	.51	-0.03	-7.86, 7.80	.99
Carrier of a clinically significant CNV *SRSpost 1.29 -7.22, 9.80 .77 -4.20 -9.15, 0.75 .097 *SRSfu 5.60 -3.13, 14.32 .21 -6.03 -11.16, -0.90 .023 *SRSpost*SSGT - - 17.28 0.24, 34.31 .047 *SRSfu*SSGT - - 23.51 6.11, 40.91 .008 *Carrier of large size	*SRSpost*SSGT	-	-	-	7.09	-2.99, 17.17	.17
**SRSpost	*SRSfu*SSGT	-	-	-	-2.44	-12.97, 8.09	.65
*\$R\$fu							
**SRSpost*SSGT	*SRSpost	1.29	-7.22, 9.80		-4.20	-9.15, 0.75	.097
**SRSfu*SSGT 23.51 6.11, 40.91 .008 Carrier of large size CNV (>500 kb) **SRSpost	*SRSfu	5.60	-3.13, 14.32	.21	-6.03	-11.16, -0.90	.023
Carrier of large size CNV (>500 kb) *SRSpost 15.08 2.60, 27.56 .019 -6.616 -23.247, 10.015 .44 *SRSpost 13.86 1.36, 26.36 .031 -4.608 -21.281, 12.064 .59 *SRSpost*SSGT - - - 21.676 1.269, 42.082 .038 *SRSfu*SSGT - - - 18.693 -1.758, 39.144 .074 *Carrier of middle size **CNV (101-500 kb) *** *** - - - 11.33, 6.96 .64 *SRSfu -8.70 -16.83, -0.57 .038 -3.60 -13.03, 5.84 .46 *SRSpost*SSGT - - - 1.50 -10.41, 13.41 .81 *SRSfu*SSGT - - - -5.09 -17.25, 7.08 .41 *Carrier of small CNV *** *** - - -5.09 -17.25, 7.08 .41 *SRSfu 0.19 -19.12, 19.49 .99 11.06 -3.15, 25.26 .13 *SRSpost*SSGT - - - 1.14 -	*SRSpost*SSGT	-	-	-	17.28	0.24, 34.31	.047
**SRSpost 15.08 2.60, 27.56 .019 -6.616 -23.247, 10.015 .44 **SRSfu 13.86 1.36, 26.36 .031 -4.608 -21.281, 12.064 .59 **SRSpost*SSGT - - 21.676 1.269, 42.082 .038 **SRSfu*SSGT - - 18.693 -1.758, 39.144 .074		-	-	-	23.51	6.11, 40.91	.008
*\$R\$\frac{1}{3.86}\$ 1.36, 26.36 .031 -4.608 -21.281, 12.064 .59 *\$R\$\frac{1}{5}\text{SP}\text{SSGT} - -							
\$R\$Spost\$SGT 18.693 -1.758, 39.144 .074 *\$Carrier of middle size CNV (101-500 kb) *\$R\$Spost	*SRSpost	15.08	2.60, 27.56	.019	-6.616	-23.247, 10.015	.44
\$R\$\frac{\text{Fu}\sqrt{\text{SGT}}}{\text{Carrier of middle size}} \text{CNV (101-500 kb)} \text{ \text{CNV (101-500 kb)}} \text{ \text{\$\text{CNV (101-500 kb)}}} \text{ \text{\$\text{\$\text{CNV (101-500 kb)}}}} \text{\$\tex{	*SRSfu	13.86	1.36, 26.36	.031	-4.608	-21.281, 12.064	.59
Carrier of middle size CNV (101-500 kb) *SRSpost -0.74 -8.82, 7.33 .86 -2.19 -11.33, 6.96 .64 *SRSfu -8.70 -16.83, -0.57 .038 -3.60 -13.03, 5.84 .46 *SRSpost*SSGT - - - 1.50 -10.41, 13.41 .81 *SRSfu*SSGT - - - -5.09 -17.25, 7.08 .41 Carrier of small CNV (20-100 kb) (20-100 kb) - - - - 99 11.06 -3.15, 25.26 .13 *SRSfu 0.19 -19.12, 19.49 .99 11.06 -3.15, 25.26 .13 *SRSpost*SSGT - - - 1.14 -17.74, 20.01 .91	*SRSpost*SSGT	-	-	-	21.676	1.269, 42.082	.038
CNV (101-500 kb) *SRSpost -0.74 -8.82, 7.33 .86 -2.19 -11.33, 6.96 .64 *SRSfu -8.70 -16.83, -0.57 .038 -3.60 -13.03, 5.84 .46 *SRSpost*SSGT - - - 1.50 -10.41, 13.41 .81 *SRSfu*SSGT - - - -5.09 -17.25, 7.08 .41 Carrier of small CNV (20-100 kb) - - - -5.09 -17.25, 7.08 .41 *SRSpost 3.45 -12.53, 19.43 .67 2.35 -9.14, 13.85 .69 *SRSfu 0.19 -19.12, 19.49 .99 11.06 -3.15, 25.26 .13 *SRSpost*SSGT - - - 1.14 -17.74, 20.01 .91	*SRSfu*SSGT	-	-	=	18.693	-1.758, 39.144	.074
*\$R\$fu							
\$R\$Spost\$SGT 1.50 -10.41, 13.41 .81 *\$R\$Sfu*\$SGT 5.09 -17.25, 7.08 .41 *\$Carrier of small CNV (20-100 kb) *\$R\$Spost 3.45 -12.53, 19.43 .67 2.35 -9.14, 13.85 .69 *\$R\$Sfu 0.19 -19.12, 19.49 .99 11.06 -3.15, 25.26 .13 *\$R\$Spost*\$SGT 1.14 -17.74, 20.01 .91	*SRSpost	-0.74	-8.82, 7.33	.86	-2.19	-11.33, 6.96	.64
*SRSfu*SSGT5.09 -17.25, 7.08 .41 Carrier of small CNV (20-100 kb) *SRSpost 3.45 -12.53, 19.43 .67 2.35 -9.14, 13.85 .69 *SRSfu 0.19 -19.12, 19.49 .99 11.06 -3.15, 25.26 .13 *SRSpost*SSGT 1.14 -17.74, 20.01 .91	*SRSfu	-8.70	-16.83, -0.57	.038	-3.60	-13.03, 5.84	.46
Carrier of small CNV (20-100 kb) *SRSpost 3.45 -12.53, 19.43 .67 2.35 -9.14, 13.85 .69 *SRSfu 0.19 -19.12, 19.49 .99 11.06 -3.15, 25.26 .13 *SRSpost*SSGT - - 1.14 -17.74, 20.01 .91	*SRSpost*SSGT	-	-	-	1.50	-10.41, 13.41	.81
(20-100 kb) *SRSpost 3.45 -12.53, 19.43 .67 2.35 -9.14, 13.85 .69 *SRSfu 0.19 -19.12, 19.49 .99 11.06 -3.15, 25.26 .13 *SRSpost*SSGT - - - 1.14 -17.74, 20.01 .91	*SRSfu*SSGT	=	-	-	-5.09	-17.25, 7.08	.41
*SRSfu 0.19 -19.12, 19.49 .99 11.06 -3.15, 25.26 .13 *SRSpost*SSGT 1.14 -17.74, 20.01 .91							
*SRSpost*SSGT 1.14 -17.74, 20.01 .91	*SRSpost	3.45	-12.53, 19.43	.67	2.35	-9.14, 13.85	.69
	*SRSfu	0.19	-19.12, 19.49	.99	11.06	-3.15, 25.26	.13
	*SRSpost*SSGT	-	-	-	1.14	-17.74, 20.01	.91
*SRSfu*SSGT 33.99, 12.02 .35	*SRSfu*SSGT	-	-	-	-10.99	-33.99, 12.02	.35

Abbreviations: SRSpost, Social Responsiveness Scale outcome at post-intervention; SRSfu, Social Responsiveness scale outcome at follow-up. "—" indicates not calculated.

 $^{^{\$}}$ Negative β estimate indicates decrease (symptoms decrease) and positive estimate increase (symptoms increase) of the SRS score from pre-intervention to post-intervention and follow-up for the carriers.

Table S6. Mixed linear model results for the association between copy number variation (CNV) and the secondary outcome measures in the active social skills group training (SSGT) participants and the total sample.

	SS	GT KONTAKT gr	oup		Total sample	
ABAS-II (parent-rated)	β\$	95%CI	P	β\$	95%CI	Р
Carrier of a rare CNV				,		
*ABAS-II_post	10.83	-5.37, 27.02	.19	-6.39	-22.223, 9.438	.43
*ABAS-II_fu	9.36	-7.22, 25.95	.27	4.15	-12.78, 21.09	.63
*ABAS-II_post*SSGT	-	-	_	17.25	-4.44, 38.95	.12
*ABAS-II fu*SSGT	-	-	-	5.00	-17.75, 27.74	.67
Carrier of a clinically					· · · · · · · · · · · · · · · · · · ·	
significant CNV						
*ABAS-II_post	-22.45	-49.17, 4.26	.10	15.94	5.29, 26.59	.0036
*ABAS-II_fu	-14.65	-42.52, 13.23	.30	14.19	3.07, 25.31	.013
*ABAS-II_post*SSGT		·		-39.82	-76.67, -2.98	.035
*ABAS-II fu*SSGT				-43.02	-80.67, -5.37	.026
Carrier of a rare large					,	
CNV (>500 kb)						
*ABAS-II_post	-28.75	-56.63, -0.88	.045	12.16	-23.78, 48.10	.51
*ABAS-II_fu	-8.72	-36.66, 19.27	.54	29.06	-6.97, 65.10	.12
*ABAS-II_post*SSGT	-	=	-	-40.39	-84.48, 3.70	.073
*ABAS-II_fu*SSGT	-	-	_	-37.78	-81.99, 6.42	.095
Carrier of middle size					,	
CNV (101-500 kb)						
*ABAS-II_post	17.80	0.07, 35.54	.051	-7.58	-27.36, 12.19	.45
*ABAS-II fu	9.48	-8.59, 27.55	.31	-4.77	-25.18, 15.64	.65
*ABAS-II_post*SSGT	-	-	-	25.22	-0.40, 50.83	.054
*ABAS-II fu*SSGT	-	-	-	14.23	-12.07, 40.53	.29
Carrier of small CNV						,_,
(25-100 kb)						
*ABAS-II_post	28.96	-9.22, 67.14	.14	-9.26	-34.01, 15.50	.46
*ABAS-II_fu	24.86	-17.92, 67.64	.26	4.19	-26.45, 34.84	.79
*ABAS-II_post*SSGT	-	<u>-</u>	-	38.28	-4.61, 81.17	.081
*ABAS-II_fu*SSGT	-	-	-	19.63	-30.16, 69.428	.44
OSU Autism CGI-S	- 4				·	_
(trainer-rated)	β#	95%CI	P	β#	95%CI	P
Carrier of a rare CNV						
*CGI-S_post	-0.01	-0.35, 0.33	1.0	0.07	-0.26, 0.40	.68
* CGI-S_fu	-0.11	-0.45, 0.23	.53	-0.05	-0.39, 0.29	.78
* CGI-S_post*SSGT	-	-	_	-0.08	-0.53, 0.37	.72
* CGI-S_fu*SSGT	-	=	-	-0.05	-0.51, 0.41	.82
Carrier of a clinically					,	
significant CNV						
*CGI-S_post	0.11	-0.45, 0.67	.71	-0.35	-0.58, -0.13	.0020
* CGI-S_fu	-0.045	-0.62, 0.54	.88	-0.38	-0.61, -0.15	.0011
* CGI-S_post*SSGT				-0.03	-0.80, 0.74	0.94
* CGI-S_fu*SSGT				0.14	-0.66, 0.95	0.73
Carrier of a rare large					· · · · · · · · · · · · · · · · · · ·	
CNV (>500 kb)						
* CGI-S_post	-0.07	-0.63, 0.49	.81	0.12	-0.63, 0.87	.75
* CGI-S_fu	-0.23	-0.83, 0.38	.46	-0.48	-1.31, 0.35	.26
* CGI-S_post*SSGT	-	-	-	-0.20	-1.11, 0.71	.67
* CGI-S_fu*SSGT	-	-	-	0.24	-0.75, 1.23	.64
Carrier of middle size					· · · · · · · · · · · · · · · · · · ·	
CNV (101-500 kb)						

* CGI-S_post	0.29	-0.08, 0.66	.13	0.07	-0.34, 0.47	.75
* CGI-S_fu	0.09	-0.28, 0.46	.6	0.05	-0.36, 0.45	.83
* CGI-S_post*SSGT	-	-	-	0.22	-0.31, 0.75	.41
* CGI-S_fu*SSGT	-	-	-	0.05	-0.48, 0.58	.85
Carrier of small CNV						
(25-100 kb)						
* CGI-S_post	-1.20	-1.98 -0.43	.003	0.01	-0.502, 0.517	.98
* CGI-S_fu	-0.52	-1.38, 0.34	.26	0.03	-0.527, 0.578	.93
* CGI-S_post*SSGT	-	-	-	-1.21	-2.09, -0.33	.008
* CGI-S_fu*SSGT	-	-	-	-0.55	-1.52, 0.42	.27
DD-CGAS	β*	95%CI	Р	β*	95% CI	Р
(trainer-rated)	Р	93%CI	Ρ	P	93% CI	Ρ
Carrier of a rare CNV						
*DD-CGAS_post	-1.32	-4.14, 1.51	.36	0.39	-2.59, 3.36	.80
* DD-CGAS_fu	-1.31	-4.17, 1.54	.37	1.76	-1.31, 4.84	.26
* DD-CGAS_post*SSGT	-	-	-	-1.70	-5.80, 2.41	.42
* DD-CGAS_fu*SSGT	-	-	-	-3.16	-7.36, 1.03	.14
Carrier of a clinically						
significant CNV						
*DD-CGAS_post	-0.20	-4.86, 4.46	.93	2.70	0.66, 4.75	.0098
* DD-CGAS_fu	-1.86	-6.70, 2.98	.45	4.01	1.93, 6.08	.00018
* DD-CGAS_post*SSGT				-0.20	-7.24, 6.83	.95
* DD-CGAS_fu*SSGT				-2.34	-9.70, 5.03	.53
Carrier of a rare large						
CNV (>500 kb)						
* DD-CGAS_post	-1.36	-6.03, 3.31	.57	0.82	-6.04, 7.68	.81
* DD-CGAS_fu	-2.45	-7.51, 2.61	.34	4.63	-2.93, 12.19	.23
* DD-CGAS_post*SSGT	-	-	-	-2.20	-10.49, 6.09	.60
* DD-CGAS_fu*SSGT	-	-	-	-7.11	-16.20, 1.97	.13
Carrier of middle size						
CNV (101-500 kb)						
*DD-CGAS_post	-2.09	-5.26, 1.07	.20	-0.17	-3.84, 3.51	.93
*DD-CGAS_fu	-1.15	-4.28, 1.97	.47	1.44	-2.26, 5.13	.45
*DD-CGAS_post*SSGT	-	-	-	-1.82	-6.66, 3.03	.46
*DD-CGAS_fu*SSGT	-	-	-	-2.56	-7.39, 2.28	.30
Carrier of small CNV						
(25-100 kb)						
*DD-CGAS_post	4.27	-2.34, 10.88	.21	0.87	-3.84, 5.57	.72
*DD-CGAS_fu	1.41	-5.90, 8.72	.71	-0.39	-5.50, 4.71	.88
*DD-CGAS_post*SSGT	-	-	-	3.17	-4.94, 11.27	.45
*DD-CGAS_fu*SSGT	-	-	-	1.41	-7.51, 10.33	.76

Abbreviations: ABAS-II the Adaptive Behavior Assessment System II; post, post-intervention; fu, follow-up; DD-CGAS, Developmental Disabilities modification of the Children's Global Assessment Scale; OSU Autism CGI-S, Ohio State University (OSU) Global Severity Scale for Autism; $^{\$}$ Negative β estimate indicates decrease (symptoms increase) and positive estimate increase (symptoms decrease) of the ABAS-II score from pre-intervention to post-intervention and follow-up for the carriers. $^{\#}$ Negative β estimate indicates decrease (symptoms decrease) and positive estimate increase (symptoms increase) of the OSU Autism CGI-S score from pre-intervention to post-intervention and follow-up for the carriers. $^{\$}$ Negative β estimate indicates decrease (symptoms decrease) and positive estimate increase (symptoms increase) of the DD-CGAS score from pre-intervention to post-intervention and follow-up for the carriers.

Table S7. IQ adjusted mixed linear model results for the association between rare genic copy number variation (CNV) and the secondary outcome measures in the active social skills group training (SSGT) participants and the total sample .

ABAS-II (parent-rated) β\$ 95%CI P β\$ 95%CI P		SSC	GT KONTAKT gro	oup	Total sample		
ABAS-II_postSGGT** **ABAS-II_fur** **BAS-II_fur** **BAS-II_fur**SGGT** **ABAS-II_fur*SGGT** **ABAS-II	ABAS-II (parent-rated)	β\$	95%CI	Р	β\$	95%CI	P
*ABAS-II_fursSGT	Carrier of a rare CNV						
*ABAS-II_fu*SSGT	*ABAS-II_post	10.85	-5.36, 27.06	.19	-6.26	-22.10, 9.58	.44
*ABAS-II_fu*SSGT	*ABAS-II_fu	9.21	-7.39, 25.81	.28	4.17	-12.77, 21.11	.63
Carrier of a clinically significant CNV	*ABAS-II_post*SSGT				17.11	-4.59, 38.82	.12
Significant CNV	*ABAS-II_fu*SSGT				4.83	-17.92, 27.59	.68
*ABAS-II_post	Carrier of a clinically						
*ABAS-II_fu	significant CNV						
*ABAS-II_post*SSGT	*ABAS-II_post	-22.31	-49.05, 4.42	.10	15.88	5.23, 26.54	.0037
*ABAS-II_fu*SSGT Carrier of a rare large CNV (>500 kb) *ABAS-II_post -28.22 -56.12, -0.32 .049 12.12 -23.84, 48.08 .51 *ABAS-II_fu -8.30 -36.26, 19.66 .56 29.16 -6.90, 65.21 .11 *ABAS-II_fu*SSGT -37.55 -81.78, 6.68 .10 *Carrier of middle size CNV (101-500 kb) *ABAS-II_post 17.84 0.09, 35.59 .05 -7.33 -27.12, 12.45 .47 *ABAS-II_post 8SGT -34.56 -24.98, 15.86 0.66 *ABAS-II_post 9.58 -8.50, 27.66 .30 -4.56 -24.98, 15.86 0.66 *ABAS-II_post 8SGT -4.00, 35.59 .05 -7.33 -27.12, 12.45 .47 *ABAS-II_fu 9.58 -8.50, 27.66 .30 -4.56 -24.98, 15.86 0.66 *ABAS-II_post 8SGT -4.00 .057 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 22.63 -20.19, 65.46 .30 4.06 -26.60, 34.71 0.80 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_fu*SSGT -2.019, 65.46 .30 4.06 -26.60, 34.71 0.80 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.48 0.48 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.		-14.18	-42.07,13.72	.32	14.29	3.17, 25.42	.012
Carrier of a rare large CNV (>\$40 kb)	*ABAS-II_post*SSGT				-39.71	-76.57, -2.85	.035
*ABAS-II_post -28.22 -56.12, -0.32 .049 12.12 -23.84, 48.08 .51 *ABAS-II_post -8.30 -36.26, 19.66 .56 29.16 -6.90, 65.21 .11 *ABAS-II_post*SSGT -39.98 -84.10, 4.14 .08 *ABAS-II_fu*SSGT -37.55 -81.78, 6.68 .10 *Carrier of middle size CNV (101-500 kb) *ABAS-II_post 17.84 0.09, 35.59 .05 -7.33 -27.12, 12.45 .47 *ABAS-II_post 9.58 -8.50, 27.66 .30 -4.56 -24.98, 15.86 .0.66 *ABAS-II_post SSGT -10.06, 50.60 .057 *ABAS-II_post 58.67 -14.04 -12.27, 40.35 .30 *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 22.63 -20.19, 65.46 .30 4.06 -26.60, 34.71 0.80 *ABAS-II_post*SSGT -24.98, 15.86 0.46 *ABAS-II_post -20.63 -20.19, 65.46 .30 4.06 -26.60, 34.71 0.80 *ABAS-II_post -26.60 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post -26.60 -3.16, 67.96 .48 *ABAS-II_post -3.16, 67.96 .48 *ABAS-II_post -3.16, 67.96 .48 *ABAS-II_post -3.16, 67.96 .48 *OSU Autism CGI-S fill -0.46, 0.23 .52 -0.049 -0.39, 0.29 .78 *CGI-S_post -0.01 -0.35, 0.32 .94 0.070 -0.26, 0.40 .67 *CGI-S_post -0.01 -0.45, 0.66 .72 -0.35 -0.58, -0.13 .0021 *CGI-S_fu*SSGT -0.047 -0.63, 0.53 .87 -0.38 -0.60, -0.15 .0012 *CGI-S_fu*SSGT -0.047 -0.63, 0.53 .87 -0.38 -0.60, -0.15 .0012 *CGI-S_post -0.07 -0.63, 0.49 .80 0.12 -0.63, 0.87 .75 *CGI-S_post -0.07 -0.63, 0.49 .80 0.12 -0.63, 0.87 .75 *CGI-S_post -0.07 -0.63, 0.49 .80 0.12 -0.63, 0.87 .75 *CGI-S_post -0.07 -0.63, 0.49 .80 0.12 -0.63, 0.87 .75 *CGI-S_post -0.07 -0.63, 0.49 .80 0.12 -0.63, 0.87 .75 *CGI-S_post -0.07 -0.63, 0.49 .80 0.12 -0.63, 0.87 .75 *CGI-S_post -0.07 -0.63, 0.49 .80 0.12 -0.63, 0.87 .75 *CGI-S_post -0.07 -0.63, 0.49 .80 0.12 -0.63, 0.87 .75	*ABAS-II_fu*SSGT				-42.76	-80.43, -5.10	.027
*ABAS-II_fut	C						
*ABAS-II_post*SSGT	*ABAS-II_post	-28.22	-56.12, -0.32	.049	12.12	-23.84, 48.08	.51
*ABAS-II_fu*SSGT	*ABAS-II_fu	-8.30	-36.26, 19.66	.56	29.16	-6.90, 65.21	.11
Carrier of middle size CNV (101-500 kb) 17.84 0.09, 35.59 .05 -7.33 -27.12, 12.45 .47 *ABAS-II post 9.58 -8.50, 27.66 .30 -4.56 -24.98, 15.86 0.66 *ABAS-II post*SSGT 24.97 -0.66, 50.60 .057 *ABAS-II post*SSGT 14.04 -12.27, 40.35 .30 Carrier of small CNV (25-100 kb) (25-100 kb) -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II post 28.263 -20.19, 65.46 .30 4.06 -26.60, 34.71 0.80 *BUS post*SSGT 37.99 -4.91, 80.90 .083 18.15<	*ABAS-II_post*SSGT				-39.98	-84.10, 4.14	.08
Net	*ABAS-II_fu*SSGT				-37.55	-81.78, 6.68	.10
*ABAS-II_post	Carrier of middle size						
*ABAS-II_fu 9.58 -8.50, 27.66 .30 -4.56 -24.98, 15.86 0.66 *ABAS-II_post*SSGT	CNV (101-500 kb)						
*ABAS-II_post*SSGT	*ABAS-II_post	17.84	0.09, 35.59	.05	-7.33	-27.12, 12.45	.47
*ABAS-II_fu*SSGT Carrier of small CNV (25-100 kb) *ABAS-II_post	*ABAS-II_fu	9.58	-8.50, 27.66	.30	-4.56	-24.98, 15.86	0.66
Carrier of small CNV (25-100 kb) *ABAS-II_post 28.46 -9.75, 66.67 .15 -9.29 -34.06, 15.48 0.46 *ABAS-II_post 22.63 -20.19, 65.46 .30 4.06 -26.60, 34.71 0.80 *ABAS-II_post*SSGT 37.99 -4.91, 80.90 .083 *ABAS-II_fu*SSGT 18.15 -31.67, 67.96 .48 OSU Autism CGI-S (trainer-rated) β# 95%CI P β# 95%CI P *CGI-S_post -0.01 -0.35, 0.32 .94 0.070 -0.26, 0.40 .67 *CGI-S_post -0.01 -0.35, 0.32 .94 0.070 -0.26, 0.40 .67 *CGI-S_post -0.01 -0.35, 0.32 .94 0.070 -0.26, 0.40 .67 *CGI-S_post -0.01 -0.46, 0.23 .52 -0.049 -0.39, 0.29 .78 *CGI-S_post*SSGT -0.084 -0.53, 0.37 .72 *CGI-S_post 0.10 -0.45, 0.66 .72 -0.35 -0.58, -0.13 .0021	*ABAS-II_post*SSGT				24.97	-0.66, 50.60	.057
\$\begin{array}{c c c c c c c c c c c c c c c c c c c	*ABAS-II_fu*SSGT				14.04	-12.27, 40.35	.30
*ABAS-II_post							
*ABAS-II_fu		29.46	0.75 66 67	15	0.20	24.06.15.49	0.46
*ABAS-II_post*SSGT							
*ABAS-II_fu*SSGT OSU Autism CGI-S (trainer-rated) Carrier of a rare CNV *CGI-S_post		22.03	-20.19, 05.40	.30		,	
OSU Autism CGI-S (trainer-rated) β# 95%CI P β# 95%CI P Carrier of a rare CNV *CGI-S_post -0.01 -0.35, 0.32 .94 0.070 -0.26, 0.40 .67 *CGI-S_fu -0.11 -0.46, 0.23 .52 -0.049 -0.39, 0.29 .78 *CGI-S_post*SSGT -0.084 -0.53, 0.37 .72 *CGI-S_fu*SSGT -0.055 -0.52, 0.41 .82 Carrier of a clinically significant CNV *CGI-S_post 0.10 -0.45, 0.66 .72 -0.35 -0.58, -0.13 .0021 *CGI-S_post -0.047 -0.63, 0.53 .87 -0.38 -0.60, -0.15 .0012 *CGI-S_post*SSGT -0.030 -0.80, 0.74 .94 *CGI-S_fu*SSGT 0.14 -0.66, 0.95 .73 Carrier of a rare large CNV (>500 kb) -0.07 -0.63, 0.49 .80 0.12 -0.63, 0.87 .75 *CGI-S_post -0.23 -0.84, 0.37 .45 -0.48 -1.30, 0.35 .26						· ·	
Carrier of a rare CNV P p* 95%CI P *CGI-S_post -0.01 -0.35, 0.32 .94 0.070 -0.26, 0.40 .67 *CGI-S_fu -0.11 -0.46, 0.23 .52 -0.049 -0.39, 0.29 .78 *CGI-S_post*SSGT -0.084 -0.53, 0.37 .72 *CGI-S_fu*SSGT -0.055 -0.52, 0.41 .82 *Carrier of a clinically significant CNV *CGI-S_post 0.10 -0.45, 0.66 .72 -0.35 -0.58, -0.13 .0021 * CGI-S_fu -0.047 -0.63, 0.53 .87 -0.38 -0.60, -0.15 .0012 * CGI-S_post*SSGT -0.030 -0.80, 0.74 .94 * CGI-S_post spost -0.07 -0.63, 0.49 .80 0.12 -0.63, 0.87 .75 * CGI-S_post -0.23 -0.84, 0.37 .45 -0.48 -1.30, 0.35 .26 * CGI-S_post*SSGT -0.20 -1.11, 0.70 .66	_					-31.07, 07.90	.40
*CGI-S_post	(trainer-rated)	β#	95%CI	P	β#	95%CI	P
* CGI-S_fu							
* CGI-S_post*SSGT			· · · · · · · · · · · · · · · · · · ·				
* CGI-S_fu*SSGT		-0.11	-0.46, 0.23	.52			
Carrier of a clinically significant CNV Significant CNV * CGI-S_post 0.10 -0.45, 0.66 .72 -0.35 -0.58, -0.13 .0021 * CGI-S_fu -0.047 -0.63, 0.53 .87 -0.38 -0.60, -0.15 .0012 * CGI-S_post*SSGT -0.030 -0.80, 0.74 .94 * CGI-S_fu*SSGT 0.14 -0.66, 0.95 .73 Carrier of a rare large CNV (>500 kb) COI-S_post -0.07 -0.63, 0.49 .80 0.12 -0.63, 0.87 .75 * CGI-S_fu -0.23 -0.84, 0.37 .45 -0.48 -1.30, 0.35 .26 * CGI-S_post*SSGT -0.20 -1.11, 0.70 .66	-					·	
*CGI-S_post					-0.055	-0.52, 0.41	.82
* CGI-S_fu	·						
* CGI-S_post*SSGT			· · · · · · · · · · · · · · · · · · ·	.72	-0.35	· · · · · · · · · · · · · · · · · · ·	.0021
* CGI-S_fu*SSGT	* CGI-S_fu	-0.047	-0.63, 0.53	.87	-0.38	-0.60, -0.15	.0012
Carrier of a rare large CNV (>500 kb) 80 0.12 -0.63, 0.87 .75 * CGI-S_post -0.23 -0.84, 0.37 .45 -0.48 -1.30, 0.35 .26 * CGI-S_post*SSGT -0.20 -1.11, 0.70 .66					-0.030	,	.94
CNV (>500 kb) * CGI-S_post -0.07 -0.63, 0.49 .80 0.12 -0.63, 0.87 .75 * CGI-S_fu -0.23 -0.84, 0.37 .45 -0.48 -1.30, 0.35 .26 * CGI-S_post*SSGT -0.20 -1.11, 0.70 .66					0.14	-0.66, 0.95	.73
* CGI-S_post							
* CGI-S_fu		-0.07	-0.63, 0.49	.80	0.12	-0.63. 0.87	.75
* CGI-S_post*SSGT -0.20 -1.11, 0.70 .66	-		· · · · · · · · · · · · · · · · · · ·			·	
		0.25	5.5., 0.5,			·	

Carrier of middle size						
* CGI-S_post	0.29	-0.09, 0.66	.13	0.07	-0.34, 0.47	.75
* CGI-S_post	0.29	-0.28, 0.46	.64	0.07	-0.36, 0.45	.82
* CGI-S_ru * CGI-S_post*SSGT	0.09	-0.26, 0.40	.04	0.03	-0.31, 0.75	.62
* CGI-S_post*SSGT				0.22	-0.48, 0.58	.85
Carrier of small CNV				0.03	-0.48, 0.38	.83
(25-100 kb)						
* CGI-S_post	-1.22	-1.99, -0.44	.002	0.08	-0.50, 0.52	.98
* CGI-S_fu	-0.54	-1.40, 0.32	.22	0.02	-0.53, 0.58	.94
* CGI-S_post*SSGT				-1.22	-2.10, -0.34	.007
* CGI-S_fu*SSGT				-0.56	-1.53, 0.41	.26
DD-CGAS	0*	050/ CI	n	0*	050/ CI	n
(trainer-rated)	β*	95%CI	P	β*	95% CI	P
Carrier of a rare CNV						
*DD-CGAS_post	-1.28	-4.11, 1.55	.38	0.39	-2.59, 3.37	.80
* DD-CGAS_fu	-1.27	-4.13, 1.59	.39	1.76	-1.31, 4.84	.26
* DD-CGAS_post*SSGT				-1.66	-5.76, 2.44	.43
* DD-CGAS_fu*SSGT				-3.10	-7.29, 1.09	.15
Carrier of a clinically						
significant CNV						
*DD-CGAS_post	-0.14	-4.80, 4.53	.95	2.71	0.67, 4.75	.0097
* DD-CGAS_fu	-1.82	-6.67, 3.02	.46	3.99	1.92, 6.06	.00019
* DD-CGAS_post*SSGT				-0.16	-7.20, 6.88	.96
* DD-CGAS_fu*SSGT				-2.31	-9.67, 5.05	.54
Carrier of a rare large						
CNV (>500 kb)						
* DD-CGAS_post	-1.33	-6.00, 3.347	.58	0.82	-6.03, 7.68	.81
* DD-CGAS_fu	-2.36	-7.42, 2.71	.36	4.62	-2.94, 12.17	.23
* DD-CGAS_post*SSGT				-2.16	-10.45, 6.12	.61
* DD-CGAS_fu*SSGT				-7.01	-16.09, 2.08	.13
Carrier of middle size CNV (101-500 kb)						
*DD-CGAS_post	-2.09	-5.26, 1.08	.20	-0.17	-3.84, 3.51	.93
*DD-CGAS fu	-1.13	-4.26, 2.00	.48	1.42	-2.27, 5.12	.45
*DD-CGAS_post*SSGT				-1.84	-6.68, 3.01	.44
*DD-CGAS_fu*SSGT				-2.53	-7.36, 2.31	.31
Carrier of small CNV					,	
(25-100 kb)						
*DD-CGAS_post	4.38	-2.24, 11.00	.20	0.87	-3.83, 5.57	.72
*DD-CGAS_fu	1.55	-5.78, 8.87	.68	-0.35	-5.45, 4.75	.89
*DD-CGAS_post*SSGT				3.39	-4.72, 11.50	.41
*DD-CGAS_fu*SSGT				1.67	-7.25, 10.59	.71
Alilian indiana ADAC				***		

Abbreviations: ABAS-II the Adaptive Behavior Assessment System II; post, post-intervention; fu, follow-up; DD-CGAS, Developmental Disabilities modification of the Children's Global Assessment Scale; OSU Autism CGI-S, Ohio State University (OSU) Global Severity Scale for Autism. $^{\$}$ Negative β estimate indicates decrease (symptoms increase) and positive estimate increase (symptoms decrease) of the ABAS-II score from pre-intervention to post-intervention and follow-up for the carriers. $^{\#}$ Negative β estimate indicates decrease (symptoms decrease) and positive estimate increase (symptoms increase) of the OSU Autism CGI-S score from pre-intervention to post-intervention and follow-up for the carriers. $^{\$}$ Negative β estimate indicates decrease (symptoms decrease) and positive estimate increase (symptoms increase) of the DD-CGAS score from pre-intervention to post-intervention and follow-up for the carriers.