Supplement

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Further details on the SPEQ measure

     SPEQ Paranoia included items adapted from the Paranoia Checklist (43), rated on a 6-point scale: "*Not at all*" (0),*"Rarely"* (1)*, "Once a month"* (2),*"Once a week"* (3)*, "Several times a week"* (4)*, "Daily"* (5) as per the published instrument*. SPEQ Hallucinations* were assessed with items from the Cardiff Anomalous Perceptions Scale (CAPS; 44) using a 6-point scale: "*Not at all*" (0)*, "Rarely"* (1)*, "Once a Month"* (2)*, "Once a Week"* (3), *"Several Times a Week"* (4)*, "Daily"* (5) as per the published instrument. *SPEQ Cognitive Disorganisation* was assessed using items from the short version of the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE; 45) using "*yes*"(1) "*no*"(0) responses as per the published instrument. *SPEQ Grandiosity* was assessed with items from the "Myself" sub-scale of Cognition Checklist for Mania-Revised (CCL-M-R; 46), the Peters et al. Delusions Inventory (PDI; 47), and items developed from clinical case studies. Responses were measured on a 4-point scale: "*Not at all*" (0), "*Somewhat*" (1), "*A great deal*" (2), "*Completely*" (3) as per CCL-M-R (46). *SPEQ Anhedonia* was assessed with items from the anticipatory pleasure subscale of the Temporal Experience of Pleasure Scale (TEPS; 48) using a 6-point scale (rated in terms of Hedonia; the total scale was then reversed): "V*ery false for me"* (0)*, "Moderately false for me"* (1)*, "Slightly false for me"* (2)*, "Slightly true for me"* (3)*, "Moderately true for me"* (4)*, "Very true for me*" (5)*, as per the original instrument (48). *SPEQ Negative Symptoms* was assessed with items devised from the Scale for the Assessment of Negative Symptoms (SANS; 49). Items tapped into five key areas of the SANS: affective flattening or blunting, alogia, avolition-apathy, anhedonia-asociality, and attention and were rated on a 4-point scale: '*Not at all true"* (0), *"Somewhat true"* (1), *"Mainly true"* (2), *"Definitely true*" (3).

eTable 1. Information on the participating and non-participating families in the study.

	Participating		Non-participating		
Male	45%		53%		
Monozygotic	35%		32%		
White	94%		91%		
Mothers had one or more A-levels (UK advanced educational qualification) as highest qualification	16%		12%		
	M	SD	M	SD	*p*
SDQ Total scale, age 4 years	8.54	4.44	9.41	4.70	<.001
SDQ Emotional problems subscale, age 4 years	1.33	1.41	1.46	1.50	<.001
SDQ Total scale, age 12 years	6.80	5.03	7.91	5.44	<.001
SDQ Emotional problems subscale, age 12 years	1.81	1.91	1.93	2.03	<.05

Note. SDQ, Strengths and Difficulties Questionnaire.

eTable 2. Descriptive statistics for psychotic experiences

	Males Mean (SD)	Females Mean (SD)	MZ Mean (SD)	DZ Mean (SD)	Sex	Zyg	ANOVA Sex*Zyg	R^2	N
Paranoia	11.76 (10.42)	12.45 (10.71)	11.79 (10.45)	12.33 (10.65)	.01	.05	.27	.00	4731
Hallucinations	4.29 (5.77)	4.89 (6.07)	4.45 (5.92)	4.71 (5.96)	.00	.11	.99	.00	4739
Cognitive disorganization	3.40 (2.73)	4.39 (2.87)	3.86 (2.83)	4.00 (2.86)	.00	.02	.68	.03	4732
Grandiosity	5.83 (4.56)	4.40 (4.25)	5.25 (4.34)	5.34 (4.45)	.00	.00	.73	.01	4735
Anhedonia	18.53 (7.99)	14.60 (7.43)	16.10 (7.95)	16.50 (7.91)	.00	.47	.82	.06	4735
Negative symptoms	3.18 (4.10)	2.52 (3.69)	2.64 (3.58)	2.91 (4.06)	.00	.02	.02	.01	4746

Note. Means and standard deviations presented prior to transformation. MZ=Monozygotic twins; DZ=Dyzygotic twins; Zyg=zygosity. Sex*Zyg = p-value associated with the effects of the interaction between sex and zygosity on the means; R^2 = proportion of the total variance explained by sex and zygosity; N= number of 1 randomly selected individual from each twin pair. Mean sex differences were previously described in Ronald et al (in press).

eTable 3 Univariate model fits for whole sample

Model	-2ll	df	χ²	Δdf	p	AIC
			Paranoia			
1. Saturated	32404.65	9438	-	-	-	-
2. ACE SD	32418.21	9451	13.559	13	0.406	-12.44
3.ACE qual	32418.95	9452	14.300	14	0.428	-13.700
4. ACE sc	**32423.72**	**9454**	**19.102**	**16**	**0.263**	**-12.898**
5. ACE no effects	32439.65	9455	35	17	0.006	1
			Hallucinations			
1. Saturated	30131.80	9448	-	-	-	-
2. ACE SD	30138.14	9461	6.339	13	0.933	-19.661
3. ACE qual	**30140.51**	**9462**	**8.714**	**14**	**0.849**	**-19.286**
4. ACE sc	30156.98	9464	25.184	16	0.067	-6.816
5. ACE no effects	30243.95	9465	112.156	17	0.000	78.156
			Cognitive Disorganisation			
1. Saturated	18359.35	9438	-	-	-	-
2. ACE SD	18377.41	9451	18.053	13	0.156	-7.947
3.ACE qual	18377.41	9452	18.053	14	0.204	-9.947
4. ACE sc	**18383.94**	**9454**	**24.587**	**16**	**0.077**	**-7.413**
5. ACE no effects	18468.62	9455	109.623	17	0.000	75.263
			Grandiosity			
1. Saturated	22070.85	9440	-	-	-	-
2. ACE SD	22086.91	9453	16.065	13	0.246	-9.935
3.ACE qual	22086.91	9454	16.065	14	0.310	-11.939
4. ACE sc	**22092.06**	**9456**	**21.21**	**16**	**0.171**	**-10.79**
5. ACE no effects	22189.31	9457	118.46	17	0.000	84.457
			Anhedonia			
1. Saturated	64719.40	9443	-	-	-	-
2. ACE SD	94729.22	9456	9.642	13	0.723	-16.36
3.ACE qual	64729.22	9457	0	14	0.775	-18.17
4. ACE sc	**64734.44**	**9459**	**15.044**	**16**	**0.521**	**-16.96**
5. ACE no effects	64753.13	9460	33.730	17	0.009	-0.270
			Negative symptoms			
1. Saturated	20554.86	9418	-	-	-	-
2. ACE SD	20569.24	9431	14.38	13	0.348	-11.62
3.ACE qual	20570.88	9432	16.01	14	0.313	-11.99
4. ACE sc	**20576.36**	**9434**	**21.50**	**16**	**0.160**	**-10.50**
5. ACE no effects	21004.71	9435	449.847	17	0.000	415.84

Note. Models were fitted using raw data maximum likelihood Best fittings model shown in bold and selected using the χ² difference and AIC. The fit statistics provided by Mx for raw data modelling are minus twice the log likelihood (-2LL) of the observations. This is not an overall measure of fit, but provides a relative measure of fit, since differences in -2LL between models are distributed as χ2. Therefore, to examine the overall fit of the genetic model, it is necessary to compare the -2LL to that of a saturated model. If the difference in χ2 is non-significant the model is said to have a good fit. Lower AIC values reflect a better fit, a difference in AIC between

two models of 2 or less, suggests evidence for both models (the most parsimonious model should be chosen), a difference of 3 indicates that the lower AIC model has more support and a difference of more than 10, indicates that the lower AIC model is a better fit compared to the higher AIC model (50). For example, although models 2, 3 and 4 provided a good description of the data for Paranoia (chi-square difference non-significant compared to saturated model) AIC estimates were very similar (within 2 of each other) thus model 4 was selected in line with rules of parsimony. -2LL = negative 2 log likelihood; df = degrees of freedom; X^2= likelihood ratio X^2 test comparing the -2LL fit of each model to the -2LL fit of the saturated model; Δdf = difference in degrees of freedom comparing each model to the saturated model; AIC = Akaike's Information Criterion); p = *p*-value. ACE SD: genetic and environmental influences specified separately for males and females, qualitative differences also estimated by allowing either rA or rC to vary for DZ opposite-sex twins. ACE Qual: genetic and environmental influences specified separately for males and females, rA or rC not allowed to vary for DZ opposite-sex twins. ACE sc: ACE estimates equated across sex but not variances. ACE no effects: ACE estimates and variances equated across sex.

eTable 4: Phenotypic correlations between psychotic experiences

	Paranoia	Hallucinations	Cognitive Disorganization	Grandiosity	Anhedonia
Hallucinations	.45 (.43-.48)**				
Cognitive Disorganization	.40 (.38-.43)**	.41 (.38-.43)**			
Grandiosity	.10 (.07-.12)**	.20 (.17-.22)**	.01 (-.02-.03)		
Anhedonia	.08 (.05-.11)**	.02 (-.01-.05)	.03 (-.01-.06)	-.16 (-.19-.13)**	
Negative symptoms	.16 (.13-.19)**	.14 (.11-.16)**	.23 (.21-.26)**	-.01 (-.04-.02)	.14 (.11-.17)**

Note. Pearson correlations presented prior to transformation and age and sex regression. Correlations between subscales were previously described in Ronald et al (in press)

**p<.01

eTable 5: Bivariate model fits for whole sample

Model	-2ll	df	χ^2	Δdf	p
Cognitive disorganization-Negative symptoms					
1. Saturated	38361.43	18836	-	-	-
2. ACE	**38712.65**	**18890**	**-**	**-**	**-**
3.AE	38783.64	18893	70.99	3	.00
4. CE	39261.91	18893	549.61	3	.00
5. E	42104.64	18896	3391.988	6	.00
Cognitive disorganization-Hallucinations					
1. Saturated	46578.63	18866	-	-	-
2. ACE	46783.29	18920	-	-	-
3.AE	**46791.25**	**18923**	**7.96**	**3**	**.05**
4. CE	46903.16	18923	119.87	3	.00
5. E	47773.25	18926	989.96	6	.00
Cognitive disorganization-Paranoia					
1. Saturated	49067.47	18856	-	-	-
2. ACE	49188.56	18910	-	-	-
3.AE	**49189.82**	**18913**	**1.26**	**3**	**.74**
4. CE	46364.99	18913	176.43	3	.00
5. E	50337.80	18916	1149.24	6	.00
Paranoia-Hallucinations					
1. Saturated	60311.74	18866	-	-	-
2. ACE	60471.69	18920	-	-	-
3.AE	**60475.86**	**18923**	**4.17**	**3**	**.24**
4. CE	60627.66	18923	155.97	3	.00
5. E	61635.30	18926	1163.61	6	.00

Note: Best fittings model shown in bold. -2LL = negative 2 log likelihood; df = degrees of freedom; X^2= likelihood ratio X^2 test comparing the -2LL fit of each model to the -2LL fit of the saturated model; Δdf = difference in degrees of freedom comparing each model to the saturated model; p = *p*-value.