

Supplementary Material

Figure S1 shows the flow chart of the study design. Overall, 17,356 children participated in at least one of Sweeps 2 (age 3) to 5 (age 11) of MCS. Of those, 2.95% (512/17356) had insufficient data and were excluded from the growth mixture modelling (GMM) analysis; 49.80% (8643/17356) had incomplete data but were included in the analysis; and finally, 47.25% (8201/17356) had complete data in both behavior and cognitive ability across assessments.

Table S1 summarizes the pairwise correlations and descriptive statistics of internalizing problems, externalizing problems and IQ at children's ages 3, 5, 7 and 11 years.

Table S2 presents the fit indices of 4- to 6- class solutions of three-parallel-process growth mixture models (GMMs) examining the joint developmental trajectories of internalizing problems, externalizing problems and IQ from ages 3 to 11 years.

Tables S3-S8 summarize the crude and adjusted estimates of regression models examining the relationships between class membership and the following outcomes at age 11 years: decision-making (measured with the CGT), bullying involvement, antisocial behavior, truancy, smoking/drinking, school liking, happiness and self-esteem.

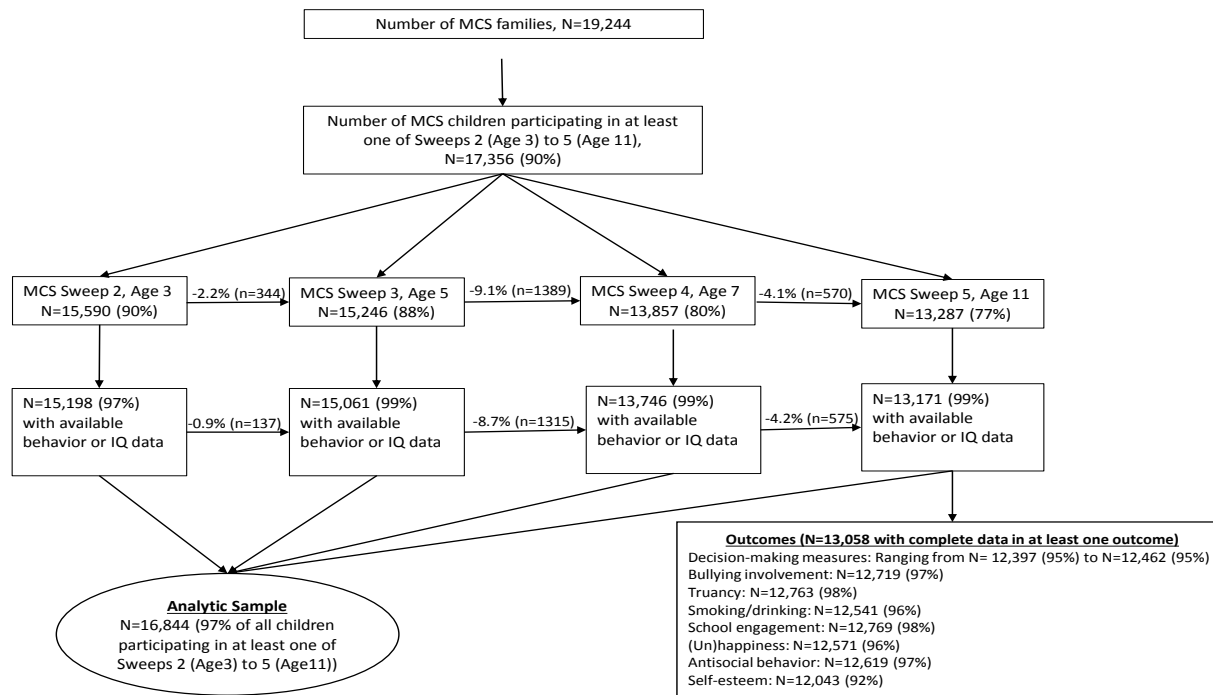


Figure S1. Flow chart of the study design

Table S1. Pairwise Pearson's correlations and descriptive statistics of the key observed study variables stratified by sex (unweighted data)												
	1	2	3	4	5	6	7	8	9	10	11	12
1. Internalizing problems, age 3	-	0.49**	0.41**	0.32**	0.38**	0.27**	0.24**	0.22**	-0.22**	-0.17**	-0.15**	-0.15**
2. Internalizing problems, age 5	0.48**	-	0.58**	0.46**	0.30**	0.40**	0.32**	0.28**	-0.20**	-0.18**	-0.18**	-0.14**
3. Internalizing problems, age 7	0.43**	0.57**	-	0.56**	0.30**	0.37**	0.47**	0.35**	-0.20**	-0.19**	-0.22**	-0.17**
4. Internalizing problems, age 11	0.33**	0.42**	0.53**	-	0.29**	0.35**	0.40**	0.51**	-0.15**	-0.18**	-0.21**	-0.18**
5. Externalizing problems, age 3	0.38**	0.30**	0.31**	0.28**	-	0.60**	0.54**	0.48**	-0.27**	-0.23**	-0.26**	-0.20**
6. Externalizing problems, age 5	0.27**	0.40**	0.35**	0.32**	0.60**	-	0.70**	0.61**	-0.24**	-0.24**	-0.28**	-0.21**
7. Externalizing problems, age 7	0.25**	0.31**	0.43**	0.35**	0.53**	0.69**	-	0.69**	-0.21**	-0.23**	-0.31**	-0.22**
8. Externalizing problems, age 11	0.23**	0.27**	0.34**	0.49**	0.47**	0.58**	0.67**	-	-0.21**	-0.23**	-0.30**	-0.25**
9. IQ, age 3	-0.23**	-0.21**	-0.19**	-0.19**	-0.27**	-0.26**	-0.25**	-0.24**	-	0.52**	0.48**	0.34**
10. IQ, age 5	-0.17**	-0.20**	-0.18**	-0.17**	-0.21**	-0.25**	-0.23**	-0.22**	0.52**	-	0.61**	0.41**
11. IQ, age 7	-0.18**	-0.20**	-0.22**	-0.24**	-0.24**	-0.29**	-0.31**	-0.30**	0.46**	0.60**	-	0.41**
12. IQ, age 11	-0.18**	-0.16**	-0.17**	-0.19**	-0.19**	-0.22**	-0.21**	-0.23**	0.35**	0.39**	0.40**	-
Males: N	7,829	7,455	6,791	6,413	7,306	7,437	6,791	6,406	6,706	7,543	6,654	6,506
Mean	3.02	2.60	2.83	3.24	7.14	5.31	5.35	5.08	98.15	98.92	99.53	100.61
SD	2.57	2.61	2.93	3.23	3.88	3.55	3.75	3.78	15.08	15.35	15.66	15.30
Females: N	7,084	7,147	6,570	6,318	7,074	7,140	6,569	6,303	6,748	7,249	6,567	6,431
Mean	2.81	2.50	2.68	3.21	6.30	4.31	4.14	3.89	102.05	101.28	100.59	99.48
SD	2.48	2.46	2.66	3.09	3.70	3.21	3.32	3.27	14.57	14.44	14.25	14.55
Note: correlations for males/females are presented above/below the diagonal												
*p<0.05												
**p<0.01												

Table S2. Fit indices of competing 1- to 6-class parallel process growth mixture models						
	1 Class	2 Classes	3 Classes	4 Classes	5 Classes	6 Classes
BIC	965405.199	961902.449	959774.984	958933.474	958360.942	956606.683
AIC	965010.880	961330.300	959063.663	958044.323	957293.960	957851.495
SSA-BIC	965243.124	961667.282	959482.614	958568.012	957922.387	957339.847
Entropy	---	0.908	0.891	0.883	0.863	0.851
Group Sizes n (%)						
Males, Class 1	8593 (51%)	7500 (45%)	945 (6%)	573 (3%)	433 (3%)	6389 (38%)
Males, Class 2		993 (6%)	7118 (42%)	7000 (42%)	6674 (40%)	503 (3%)
Males, Class 3			530 (3%)	501 (3%)	709 (4%)	516 (3%)
Males, Class 4				519 (3%)	568 (3%)	413 (2%)
Males, Class 5					209 (1%)	133 (1%)
Males, Class 6						639 (4%)
Females, Class 1	8251 (49%)	742 (4%)	6991 (42%)	6927 (41%)	256 (2%)	262 (2%)
Females, Class 2		7509 (45%)	620 (4%)	544 (3%)	147 (1%)	159 (1%)
Females, Class 3			640 (4%)	348 (2%)	653 (4%)	6379 (38%)
Females, Class 4				432 (3%)	759 (5%)	617 (4%)
Females, Class 5					6436 (38%)	634 (4%)
Females, Class 6						200 (1%)
Shaded cells indicate the selected model; BIC=Bayesian information criterion; AIC=Akaike information criterion; SSA-BIC=Sample size adjusted BIC						

Table S3. Crude and adjusted regression estimates (SE) of class membership on decision-making using the CGT stratified by sex									
	Risk taking			Delay aversion			Deliberation time		
	Crude	Model A^a	Model B^b	Crude	Model A^a	Model B^b	Crude	Model A^a	Model B^b
Males									
Typically Developing	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Improvers	0.03 (0.01)	0.02 (0.01)	0.02 (0.01)	-0.02 (0.02)	-0.03 (0.02)	-0.02 (0.02)	-0.08 (0.08)	-0.04 (0.08)	-0.07 (0.08)
Deteriorators	0.02 (0.01)	0.02 (0.01)	0.01 (0.01)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.12 (0.08)	0.11 (0.09)	0.10 (0.09)
Troubled	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.04 (0.02)*	0.04 (0.02)*	0.04 (0.02)*	0.10 (0.08)	0.10 (0.08)	0.07 (0.08)
Females									
Typically Developing	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Improvers	0.03 (0.01)	0.01 (0.01)	0.01 (0.01)	0.02 (0.02)	0.00 (0.02)	-0.00 (0.02)	0.01 (0.15)	0.05 (0.15)	0.05 (0.15)
Deteriorators	0.04 (0.01)	0.04 (0.01)	0.04 (0.01)	0.06 (0.02)	0.05 (0.02)	0.05 (0.02)*	0.31 (0.13)*	0.30 (0.13)*	0.31 (0.13)*
Troubled	-0.00 (0.01)	-0.01 (0.01)	-0.02 (0.01)	0.01 (0.03)	0.01 (0.03)	-0.01 (0.03)	0.27 (0.12)*	0.26 (0.13)*	0.28 (0.13)*

Bold indicates $p < 0.01$.

*Significant at the 0.05 level

^aAdjustments for socioeconomic disadvantage, ethnicity, maternal education, birth weight, maternal age at birth, maternal smoking and family structure

^bAdjustments for Model A covariates + maternal psychological distress, parent-child relationship, harsh parental discipline, household chaos, quality of emotional support, parental involvement, regular bedtimes and breastfeeding

Table S4. Crude and adjusted regression estimates (SE) of class membership on decision-making using the CGT stratified by sex (continued)									
	Overall proportion bet			Quality of decision-making			Risk adjustment		
	Crude	Model A^a	Model B^b	Crude	Model A^a	Model B^b	Crude	Model A^a	Model B^b
Males									
Typically Developing	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Improvers	0.03 (0.01)	0.02 (0.01)*	0.02 (0.01)	0.01 (0.01)	0.02 (0.01)	0.02 (0.01)	-0.01 (0.05)	0.07 (0.06)	0.08 (0.06)
Deteriorators	0.02 (0.01)*	0.02 (0.01)*	0.02 (0.01)	-0.02 (0.01)*	-0.01 (0.01)	-0.01 (0.01)	-0.16 (0.06)*	-0.12 (0.07)	-0.11 (0.07)
Troubled	0.01 (0.01)	0.00 (0.01)	0.00 (0.01)	-0.03 (0.01)	-0.03 (0.01)*	-0.02 (0.01)*	-0.19 (0.07)	-0.14 (0.07)*	-0.14 (0.07)*
Females									
Typically Developing	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Improvers	0.04 (0.01)	0.02 (0.01)	0.01 (0.01)	-0.02 (0.01)	-0.02 (0.01)	-0.02 (0.01)	-0.13 (0.06)*	-0.05 (0.06)	-0.03 (0.06)
Deteriorators	0.04 (0.01)	0.04 (0.01)	0.03 (0.01)	-0.04 (0.01)	-0.03 (0.01)*	-0.03 (0.01)*	-0.27 (0.07)	-0.23 (0.07)	-0.22 (0.07)
Troubled	0.00 (0.01)	-0.00 (0.01)	-0.01 (0.01)	-0.02 (0.01)	-0.01 (0.01)	-0.01 (0.02)	-0.28 (0.07)	-0.19 (0.07)	-0.16 (0.08)*

Bold indicates $p < 0.01$.

*Significant at the 0.05 level

^aAdjustments for socioeconomic disadvantage, ethnicity, maternal education, birth weight, maternal age at birth, maternal smoking and family structure

^bAdjustments for Model A covariates + maternal psychological distress, parent-child relationship, harsh parental discipline, household chaos, quality of emotional support, parental involvement, regular bedtimes and breastfeeding

Table S5. Crude and adjusted OR (95%CI) of multinomial logit regression models examining the relationship between class membership and bullying involvement stratified by sex												
	Crude				Model A ^a				Model B ^b			
	Neutral	Bully	Bully-victim	Victim	Neutral	Bully	Bully-victim	Victim	Neutral	Bully	Bully-victim	Victim
Males												
Typically Developing	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Improvers	Ref	0.93 (0.46-1.90)	0.90 (0.67-1.22)	0.89 (0.64-1.24)	Ref	0.73 (0.35-1.53)	0.94 (0.69-1.27)	1.00 (0.72-1.40)	Ref	0.68 (0.32-1.46)	0.87 (0.64-1.18)	0.94 (0.67-1.33)
Deteriorators	Ref	2.07 (1.20-3.57)	3.06 (2.26-4.14)	2.23 (1.61-3.08)	Ref	1.93 (1.11-3.36)	3.04 (2.24-4.12)	2.20 (1.59-3.04)	Ref	1.80 (1.04-3.11)*	2.98 (2.19-4.06)	2.16 (1.56-2.99)
Troubled	Ref	1.02 (0.57-1.80)	2.27 (1.64-3.13)	2.47 (1.75-3.49)	Ref	0.89 (0.50-1.58)	2.25 (1.64-3.11)	2.49 (1.78-3.50)	Ref	0.87 (0.48-1.57)	2.16 (1.57-2.98)	2.38 (1.68-3.37)
Females												
Typically Developing	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Improvers	Ref	1.80 (0.74-4.44)	1.01 (0.72-1.41)	0.86 (0.82-1.42)	Ref	1.31 (0.48-3.56)	0.92 (0.64-1.31)	1.12 (0.83-1.49)	Ref	1.23 (0.43-3.54)	0.87 (0.62-1.23)	1.09 (0.82-1.46)
Deteriorators	Ref	1.31 (0.55-3.10)	2.49 (1.73-3.57)	2.81 (2.06-3.83)	Ref	1.20 (0.49-2.93)	2.39 (1.66-3.45)	2.77 (2.01-3.81)	Ref	1.11 (0.44-2.81)	2.34 (1.62-3.37)	2.74 (1.99-3.78)
Troubled	Ref	1.90 (0.61-5.90)	2.11 (1.34-3.32)	2.91 (2.06-4.12)	Ref	1.50 (0.47-4.74)	1.95 (1.34-3.08)	2.82 (1.98-4.02)	Ref	1.45 (0.46-4.50)	1.76 (1.11-2.79)*	2.70 (1.90-3.84)

Bold indicates p<0.01.

*Significant at the 0.05 level

^aAdjustments for socioeconomic disadvantage, ethnicity, maternal education, birth weight, maternal age at birth, maternal smoking and family structure

^bAdjustments for Model A covariates + maternal psychological distress, parent-child relationship, harsh parental discipline, household chaos, quality of emotional support, parental involvement, regular bedtimes and breastfeeding

Table S6. Crude and adjusted OR (95%CI) of logistic and ordered logistic regression models examining the relationship of class membership with truancy, school liking and happiness stratified by sex									
	Truancy			School (dis)liking			(Un)happiness		
	Crude	Model A^a	Model B^b	Crude	Model A^a	Model B^b	Crude	Model A^a	Model B^b
Males									
Typically Developing	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Improvers	2.01 (1.24-3.28)	1.44 (0.85-2.42)	1.25 (0.72-2.18)	1.00 (0.79-1.26)	1.12 (0.89-1.40)	1.06 (0.84-1.33)	0.98 (0.73-1.31)	1.00 (0.74-1.35)	0.88 (0.64-1.21)
Deteriorators	3.71 (2.61-5.28)	3.01 (2.10-4.32)	2.83 (1.95-4.11)	2.04 (1.60-2.62)	1.82 (1.41-2.36)	1.75 (1.34-2.27)	3.31 (2.53-4.33)	3.11 (2.37-4.09)	2.97 (2.25-3.92)
Troubled	1.41 (0.78-2.55)	1.13 (0.62-2.04)	1.06 (0.56-1.98)	1.68 (1.27-2.21)	1.59 (1.20-2.12)	1.54 (1.16-2.05)	2.92 (2.17-3.92)	2.79 (2.06-3.77)	2.56 (1.87-3.50)
Females									
Typically Developing	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Improvers	3.09 (1.77-5.40)	2.34 (1.24-4.40)	2.35 (1.24-4.43)	1.01 (0.76-1.35)	1.11 (0.84-1.49)	1.07 (0.80-1.43)	1.54 (1.14-2.09)	1.60 (1.17-2.19)	1.47 (1.06-2.06)*
Deteriorators	2.51 (1.28-4.92)	2.11 (1.11-4.00)*	2.22 (1.17-4.22)*	2.05 (1.59-2.64)	1.97 (1.52-2.55)	1.92 (1.48-2.50)	3.06 (2.38-3.93)	2.86 (2.20-3.71)	2.76 (2.12-3.59)
Troubled	5.31 (2.96-9.53)	3.89 (2.13-7.10)	4.15 (2.14-8.04)	1.77 (1.30-2.41)	1.64 (1.18-2.27)	1.51 (1.08-2.10)*	2.59 (1.83-3.66)	2.27 (1.59-3.24)	1.90 (1.30-2.78)

Bold indicates p<0.01.

*Significant at the 0.05 level

^aAdjustments for socioeconomic disadvantage, ethnicity, maternal education, birth weight, maternal age at birth, maternal smoking and family structure

^bAdjustments for Model A covariates + maternal psychological distress, parent-child relationship, harsh parental discipline, household chaos, quality of emotional support, parental involvement, regular bedtimes and breastfeeding

Table S7. Crude and adjusted OR (95%CI) of logistic regression models examining the relationship of class membership with antisocial behavior and smoking/drinking status stratified by sex						
	Antisocial behavior			Smoking/drinking		
	Crude	Model A^a	Model B^b	Crude	Model A^a	Model B^b
Males						
Typically Developing	Ref	Ref	Ref	Ref	Ref	Ref
Improvers	0.84 (0.62-1.14)	0.74 (0.54-1.01)	0.66 (0.48-0.91)*	0.77 (0.53-1.11)	0.85 (0.59-1.22)	0.75 (0.52-1.10)
Deteriorators	2.37 (1.89-2.98)	2.06 (1.64-2.60)	1.94 (1.54-2.44)	1.99 (1.45-2.72)	1.70 (1.23-2.35)	1.59 (1.15-2.20)
Troubled	1.87 (1.43-2.43)	1.65 (1.25-2.18)	1.52 (1.14-2.02)	1.07 (0.70-1.64)	0.95 (0.62-1.46)	0.87 (0.57-1.34)
Females						
Typically Developing	Ref	Ref	Ref	Ref	Ref	Ref
Improvers	1.57 (1.16-2.12)	1.39 (1.01-1.92)*	1.26 (0.92-1.74)	1.20 (0.76-1.88)	1.42 (0.90-2.23)	1.28 (0.82-1.99)
Deteriorators	2.22 (1.66-2.96)	2.03 (1.50-2.74)	1.95 (1.44-2.65)	1.40 (0.86-2.28)	1.25 (0.77-2.04)	1.21 (0.75-1.96)
Troubled	1.95 (1.38-2.76)	1.56 (1.11-2.19)*	1.31 (0.91-1.87)	1.01 (0.60-1.69)	0.83 (0.49-1.43)	0.67 (0.38-1.18)

Bold indicates p<0.01.

*Significant at the 0.05 level

^aAdjustments for socioeconomic disadvantage, ethnicity, maternal education, birth weight, maternal age at birth, maternal smoking and family structure

^bAdjustments for Model A covariates + maternal psychological distress, parent-child relationship, harsh parental discipline, household chaos, quality of emotional support, parental involvement, regular bedtimes and breastfeeding

Table S8. Crude and adjusted regression estimates (SE) of class membership on self-esteem stratified by sex

	(Low) self-esteem		
	Crude	Model A^a	Model B^b
Males			
Typically Developing	Ref	Ref	Ref
Improvers	0.13 (0.14)	0.21 (0.14)	0.15 (0.15)
Deteriorators	0.71 (0.16)	0.65 (0.16)	0.62 (0.16)
Troubled	0.76 (0.17)	0.74 (0.17)	0.71 (0.17)
Females			
Typically Developing	Ref	Ref	Ref
Improvers	0.40 (0.16)*	0.51 (0.16)	0.44 (0.17)*
Deteriorators	0.81 (0.17)	0.75 (0.17)	0.71 (0.17)
Troubled	0.77 (0.21)	0.67 (0.20)	0.54 (0.20)

Bold indicates $p < 0.01$.

*Significant at the 0.05 level

^aAdjustments for socioeconomic disadvantage, ethnicity, maternal education, birth weight, maternal age at birth, maternal smoking and family structure

^bAdjustments for Model A covariates + maternal psychological distress, parent-child relationship, harsh parental discipline, household chaos, quality of emotional support, parental involvement, regular bedtimes and breastfeeding