

# Fragile X Syndrome and Down Syndrome: Language Profiles in Children

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Table 1. Background characteristics for boys with fragile X syndrome, boys with Down syndrome, and typically developing boys

Background Characteristics	Fragile X Syndrome (N = 83)	Down Syndrome (N = 38)	Typically Developing (N = 42)
Chronological Age in months at 1st Assessment	105.2 (34.7)	99.6 (38.9)	52.3 (14.3)
Leiter Developmental Age in months at 1st Assessment	55.8 (12.5)	54.4 (13.1)	56.2 (11.7)
Maternal Education (in years)	14.6 (2.2)	15.7 (2.5)	16.4 (2.1)

Table 2. Mean Developmental Age (DA) Scores on Speech and Language Measures Grouped by Leiter-R DA for Boys with Fragile X Syndrome and Down Syndrome and Typically Developing Boys

	Leiter-R Developmental Age			
	< 49 months <sup>a</sup>	49-60 months	61-72 months	> 72 months
Sample Size				
FXS overall	19 - 28 <sup>b</sup>	44 - 50	95 - 97	7 - 8
FXS + Autism	8 - 13	10 - 13	13	0
FXS + Spectrum	8 - 10	14 - 15	37 - 38	1 - 2
FXS only	2 - 7	17 - 19	43 - 45	6
DS	8 - 14	17 - 28	16 - 18	4
TD	10 - 11	28	20	26
PPVT				
FXS overall	40 (13) <sup>c</sup>	53 (13)	73 (21)	87 (22)
FXS + Autism	37 (12)	50 (11)	80 (32)	-
FXS + Spectrum	39 (7)	53 (12)	68 (22)	79 (37)
FXS only	55 (30)	53 (17)	76 (17)	90 (19)
DS	33 (8)	44 (13)	57 (13)	84 (20)
TD	43 (18)	61 (16)	73 (19)	106 (25)
EVT				
FXS overall	36 (10)	45 (12)	60 (14)	67 (17)
FXS + Autism	34 (11)	39 (11)	65 (17)	-
FXS + Spectrum	39 (8)	50 (14)	57 (12)	52 (7)
FXS only	37 (10)	46 (10)	62 (15)	72 (17)
DS	36 (8)	47 (11)	57 (12)	82 (13)
TD	42 (17)	56 (14)	68 (14)	95 (15)
GFTA				
FXS overall	43 (10)	50 (12)	62 (13)	64 (9)
FXS + Autism	42 (7)	45 (11)	67 (16)	-
FXS + Spectrum	47 (13)	52 (13)	60 (14)	51 (-)
FXS only	40 (10)	52 (12)	61 (12)	67 (8)
DS	30 (3)	34 (6)	37 (11)	48 (8)
TD	54 (21)	57 (13)	60 (12)	73 (17)

<sup>a</sup> Mean developmental age on the Leiter-R; <sup>b</sup> Ranges of N due to missing data; <sup>c</sup> SD in parentheses; PPVT = Peabody Picture Vocabulary Test-III; EVT = Expressive Vocabulary Test; GFTA = Goldman-Fristoe Test of Articulation-2

## Abstract

WE COMPARED DEVELOPMENTAL TRAJECTORIES of receptive language, expressive language, and speech production of 83 boys with fragile X syndrome (FXS) (3 to 14 years) with differing levels of autistic characteristics, 38 boys with Down syndrome (DS) (4 to 15 years), and 42 typically developing (TD) mental-age matched boys (2 to 6 years). All boys were tested annually one to four times using standardized tests. The boys with FXS and DS had greater delays and a slower rate of growth for both receptive and expressive vocabulary and speech production than did the TD boys after controlling for nonverbal cognitive level. Differences for receptive and expressive vocabulary and speech production between the boys with DS and FXS depended on the levels of autistic characteristics in the boys with FXS.

## Background

Fragile X Syndrome is the leading inherited cause of mental retardation, while Down Syndrome is the most common occurring genetic cause of mental retardation. Both boys with FXS and boys with DS have moderate degrees of mental retardation, with speech and language delays.

## Study Questions

- Do boys with FXS differ from mental-age matched TD boys in their extent of delay or rate of growth of receptive vocabulary, expressive vocabulary, and/or speech production?
- Do boys with FXS differ from mental-age matched boys with DS in their extent of delay or rate of growth of receptive vocabulary, expressive vocabulary, and/or speech production?
- Within boys with FXS, do levels of autistic characteristics influence the extent of delay or rate of growth of receptive vocabulary, expressive vocabulary, and/or speech production?

## Procedure

Children assessed annually one to four times on:

- Peabody Picture Vocabulary Test-III (PPVT)—receptive vocabulary
- Expressive Vocabulary Test (EVT)—expressive vocabulary
- Goldman-Fristoe Test of Articulation-2 (GFTA)—speech production in single words
- Leiter International Performance Scale-R (Leiter-R)—nonverbal cognitive level
- Autism Diagnostic Observation Schedule (ADOS) administered once—autistic characteristics

On the ADOS, 19 boys with FXS scored in autistic category, 31 autistic spectrum, and 33 no autism. Repeated measures analyses using hierarchical linear models compared groups of boys with DS, FXS (no autism, autistic spectrum disorder, and autistic disorder) and TD boys on the PPVT, EVT, and GFTA after controlling for the boys' Leiter-R performance

## Results

### 1. Receptive Vocabulary

(See Table 2 & Figure 1)

- A. Delay
- Greater for DS and FXS (all groups) than TD
  - Greater for DS than FXS (no autism); FXS (spectrum and autism) = DS
- B. Rate of Growth
- Slower (about 1/4<sup>th</sup> expected rate) for DS and FXS than TD
  - DS = FXS



### 2. Expressive Vocabulary

(See Table 2 & Figure 2)

- A. Delay
- Greater for DS and FXS (no autism, spectrum, and autism) than TD
  - Greater for DS than FXS (spectrum); DS = FXS (no autism and autism)
- B. Rate of Growth
- Slower for DS (1/4<sup>th</sup> expected rate) and FXS (1/5<sup>th</sup> expected rate) than TD
  - Greater for DS than FXS (spectrum); DS = FXS (no autism and autism)

Figure 1. Predicted trajectories for receptive vocabulary for males with DS and FXS (autistic, spectrum, or not autistic)

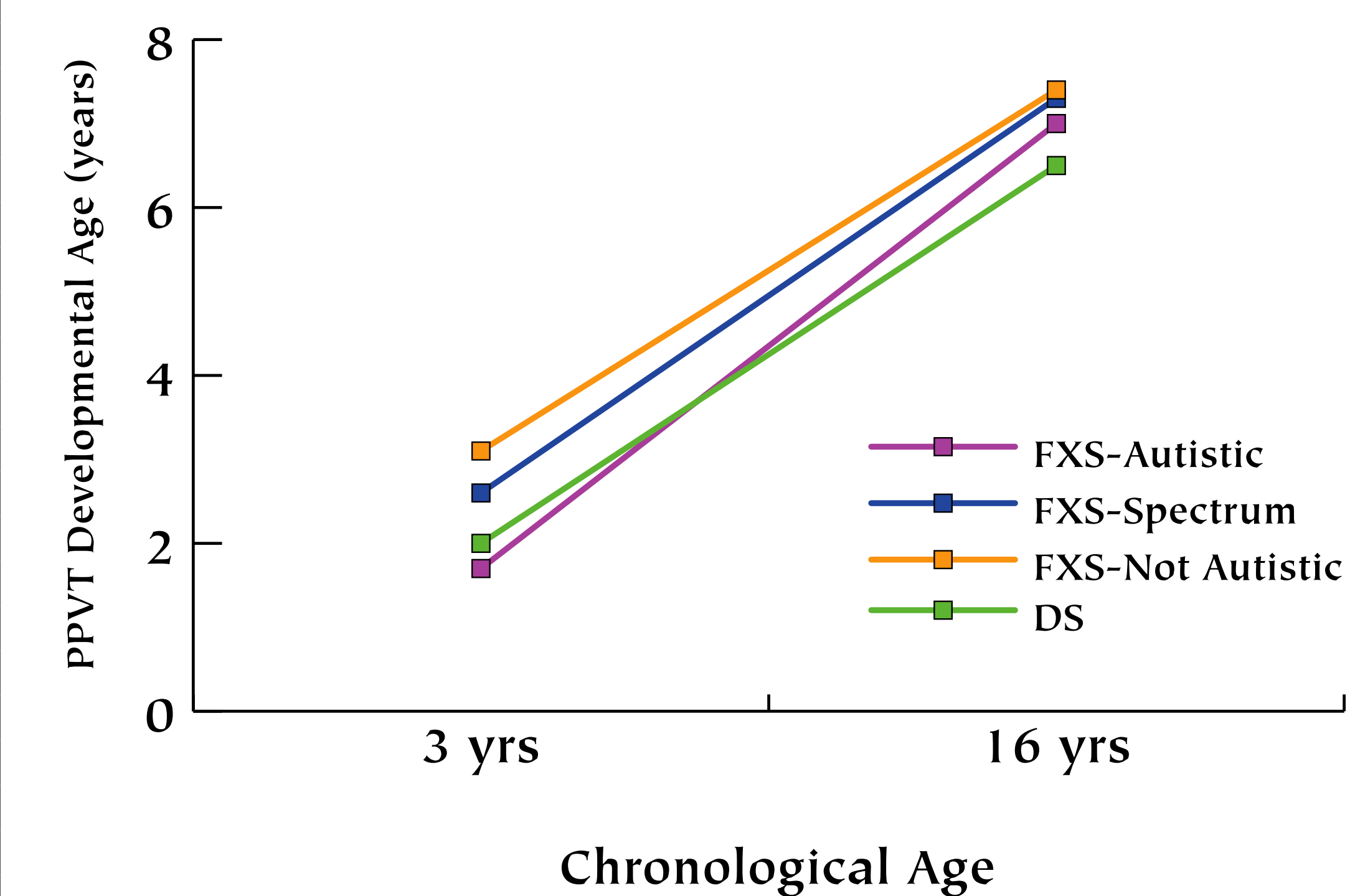
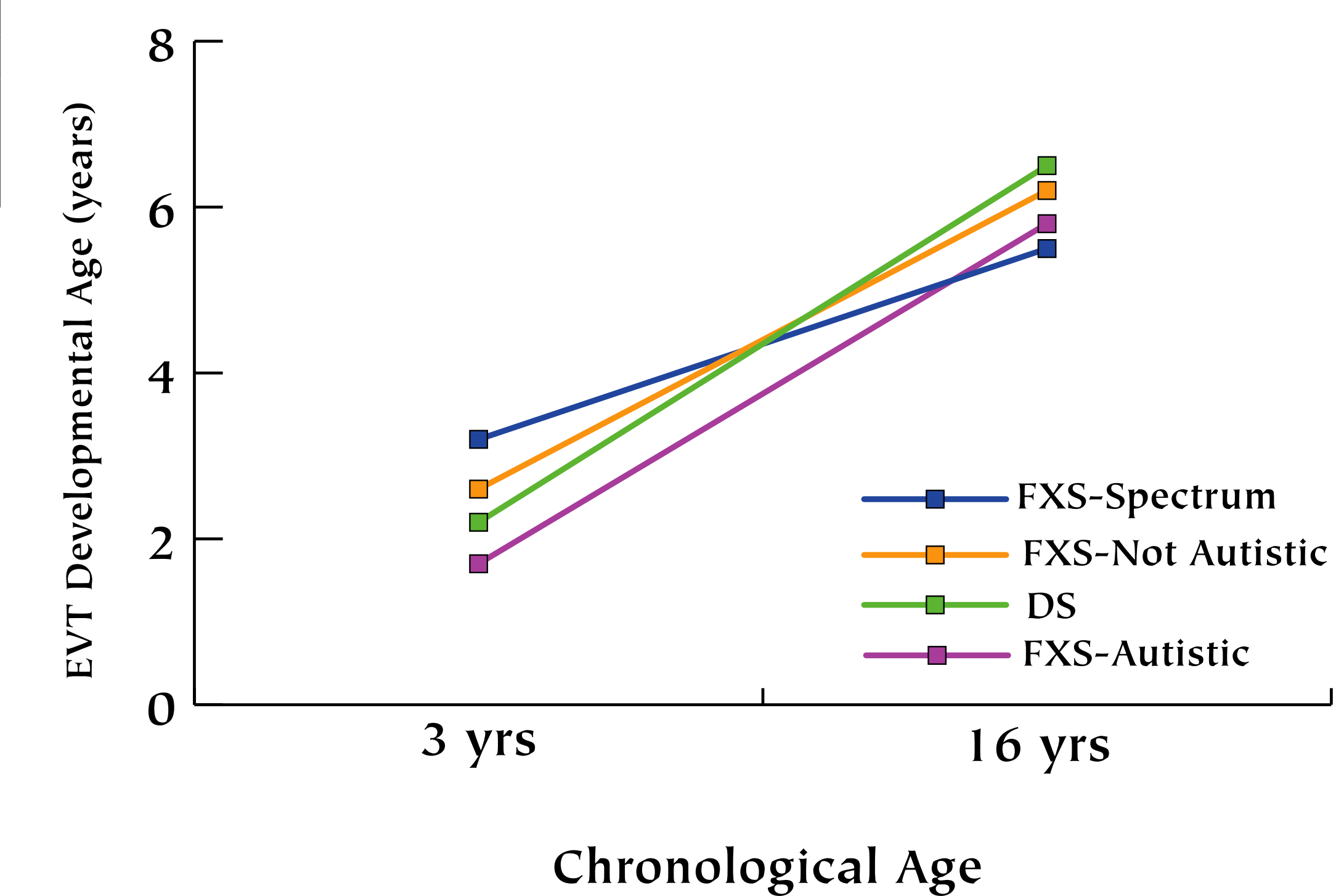


Figure 2. Predicted trajectories for expressive vocabulary for males with DS and FXS (autistic, spectrum, and not autistic)

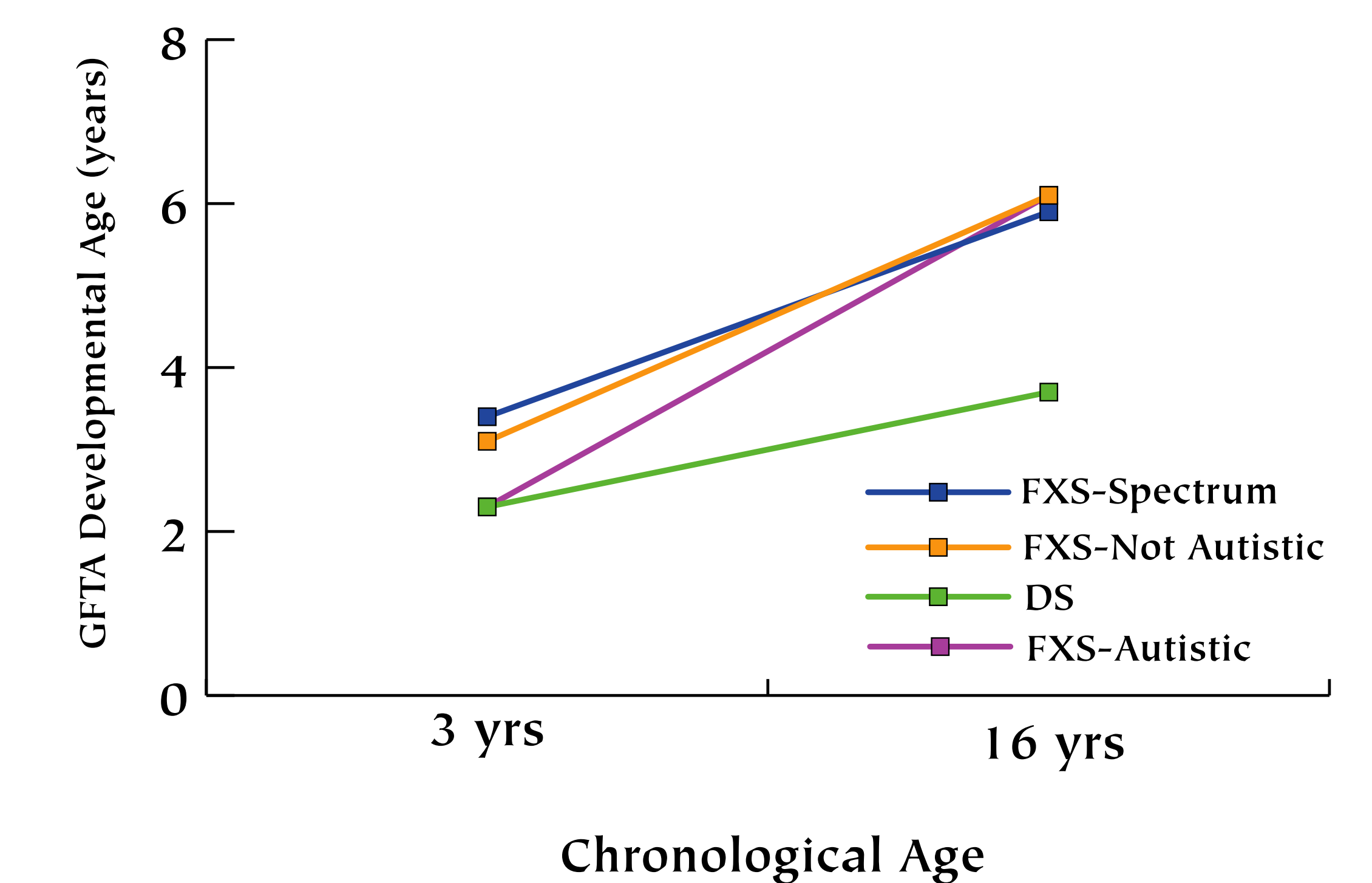


### 3. Speech Production

(See Table 2 and Figure 3)

- A. Delay
- Greater for DS and FXS (autism, spectrum, and no autism) than TD
  - Greater for DS versus FXS (spectrum and no autism); DS = FXS (autism)
- B. Rate of Growth
- Slower for DS (1/20<sup>th</sup> expected rate) and FXS (1/4<sup>th</sup> to 1/5<sup>th</sup> expected rate) than TD
  - Greater for FXS (autism and spectrum) than DS; FXS (no autism) = DS

Figure 3. Predicted trajectories for speech production for males with DS and FXS (autistic, spectrum, and not autistic)



## Conclusions

The boys with FXS and DS had greater delays and a slower rate of growth for both receptive and expressive vocabulary and speech production than did the TD boys after controlling for nonverbal cognitive level. Differences for receptive and expressive vocabulary and speech production between the boys with DS and FXS depended on the levels of autistic characteristics in the boys with FXS.