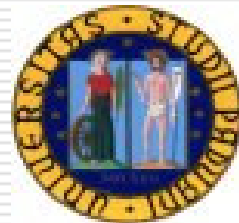


**Vincenza Tarantino¹, Simone Cutini¹, Carla Mogentale²,
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**La variabilità intra-individuale dei
tempi di reazione in bambini con ADHD
analizzata secondo una distribuzione
ex-gaussiana**



LA VARIABILITÀ INTRA-INDIVIDUALE

- ❑ Numerosi studi hanno dimostrato che i soggetti con ADHD presentano tempi di reazione (TR) a test cognitivi mediamente **più alti** rispetto al gruppo di controllo e, soprattutto, maggiormente variabili.
 - ❑ Analizzando più dettagliatamente la distribuzione di frequenza dei TR dei singoli soggetti si è osservato che questa tipicamente mostra un'accentuata **coda positiva**, che riflette la presenza di risposte molto più lente rispetto alla media del soggetto stesso, ed è più **concentrata verso lo zero**.
 - ❑ Tali informazioni purtroppo non sono adeguatamente rappresentate dalle classiche analisi di media e deviazione standard.
-

LA VARIABILITÀ INTRA-INDIVIDUALE



Review

TRENDS in Cognitive Sciences Vol.10 No.3 March 2006

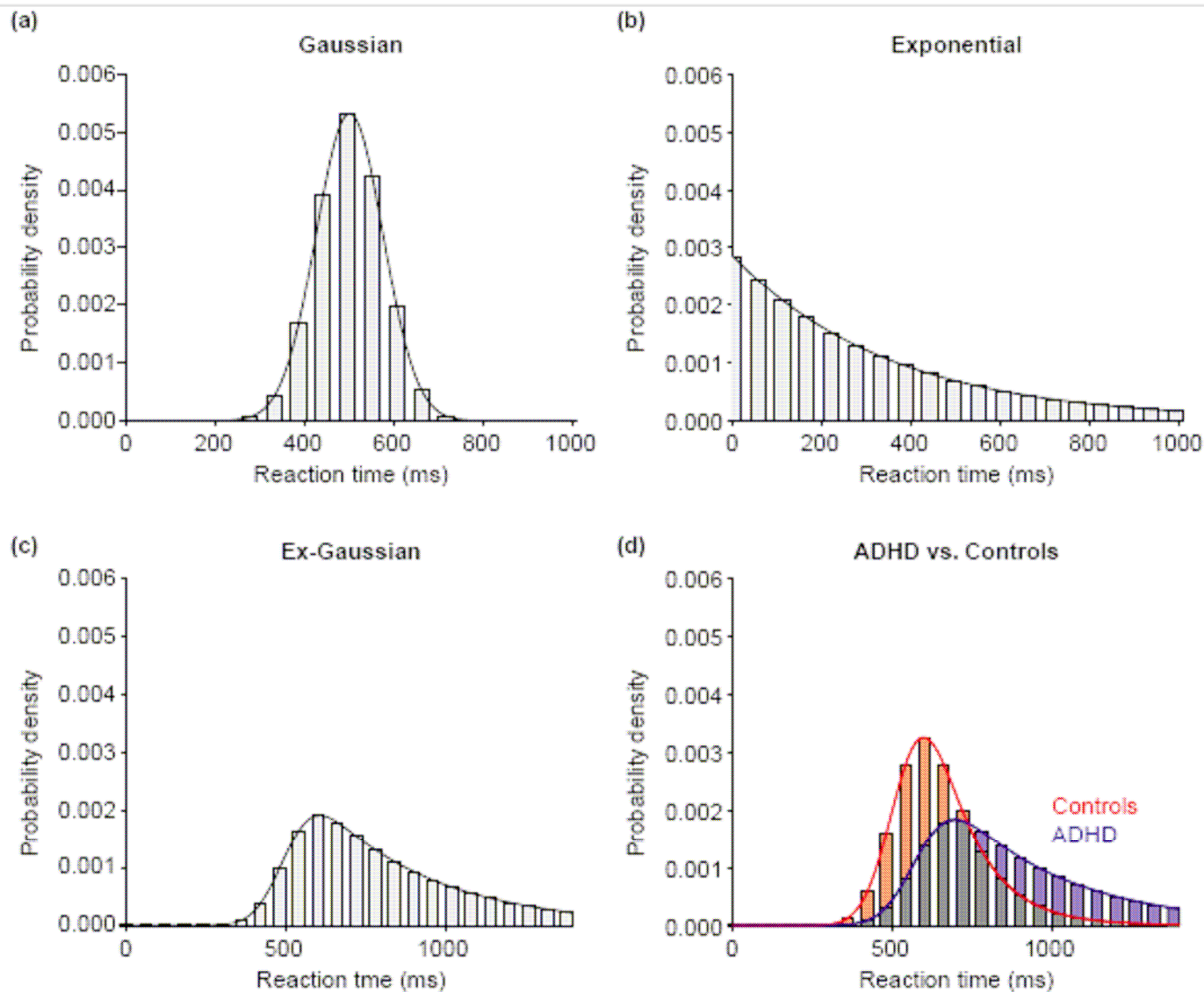
Full text provided by www.sciencedirect.com

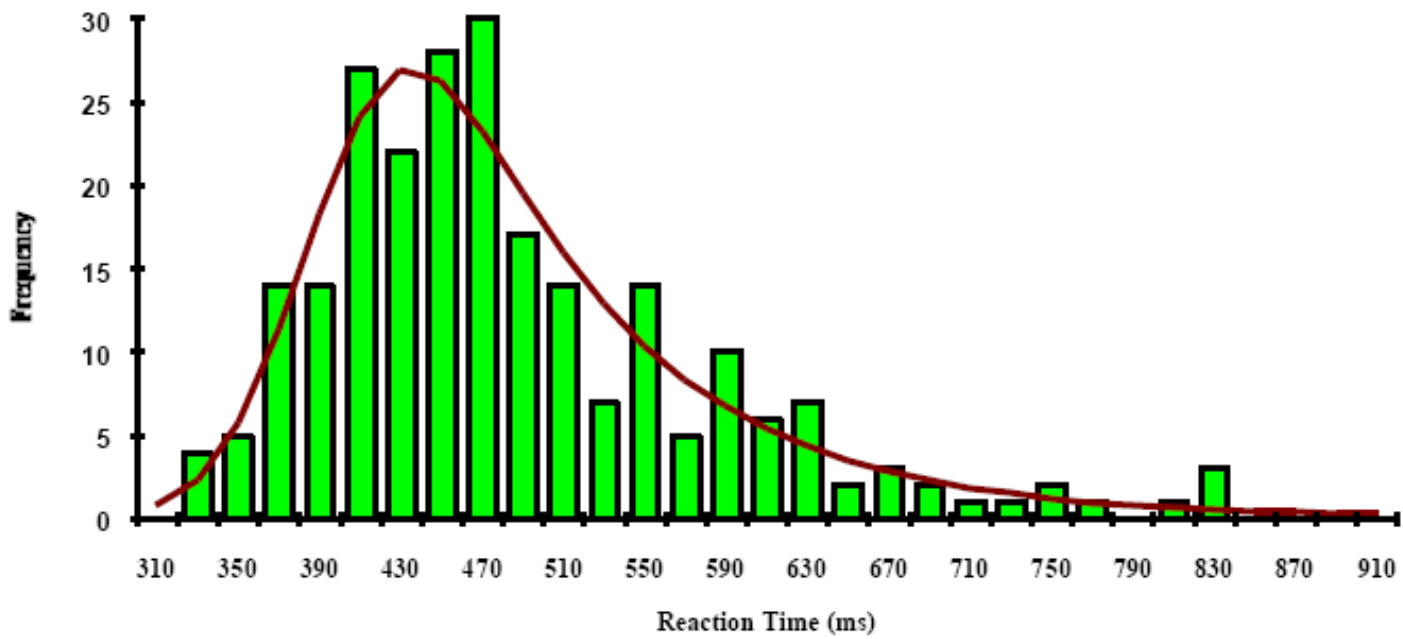
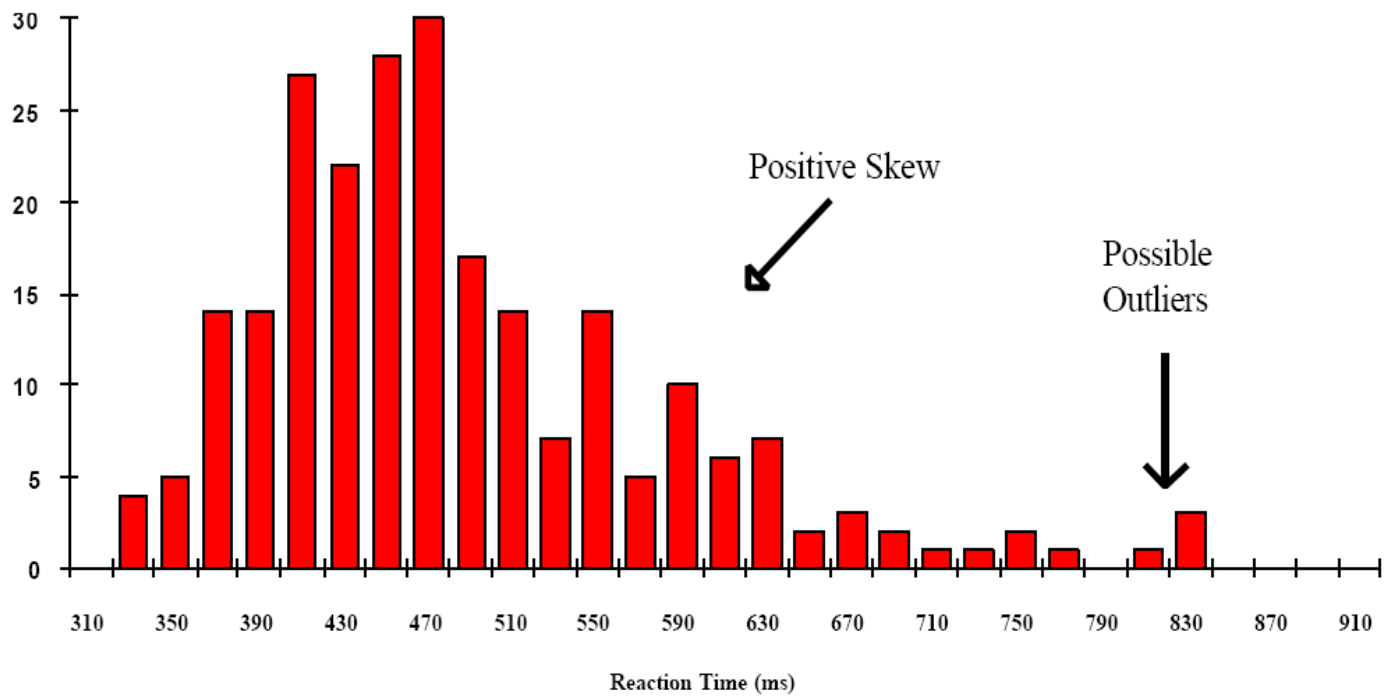


Characterizing cognition in ADHD: beyond executive dysfunction

F. Xavier Castellanos¹, Edmund J.S. Sonuga-Barke^{1,2}, Michael P. Milham¹
and Rosemary Tannock³

LA DISTRIBUZIONE EX-GAUSSIANA





Distribuzione EX-GAUSSIANA

- “Fitta” più precisamente la distribuzione dei tempi di reazione (Heathcote et al., 1991)
-

- Descritta da 3 parametri:
 - Mu μ → media della componente distribuita normalmente → prestazione **media**
 - Sigma σ → deviazione standard della componente distribuita normalmente → **variabilità** nella prestazione
 - Tau τ → media e variabilità della componente distribuita esponenzialmente → riflette gli **estremi** della prestazione.

- MEDIA: $M_{RT} = \mu + \sigma$

- VARIANZA $S^2_{RT} = \sigma^2 + \tau^2$

OBIETTIVO

- Analizzare la variabilità intra-individuale dei tempi di reazione (TR) durante il CPT per mezzo di una funzione di probabilità ex-gaussiana.
-

IL CAMPIONE (Tot. 96)

- ADHD (n= 48)
 - 8-13 anni (M=10.97, DS= 1.84)
 - Maschi= 89.6%
 - SDAG > 10
 - Sottotipo: 27.9% disattento, 9.3% iperattivo/impulsivo, 62.8% combinato
 - Comorbidità: 16.7% dist. apprendimento, 14.6% dist. comportamentale, 22.9% dist. apprend. + dist. comport.

 - Controllo (n= 53)
 - 8-13 anni (M= 11.07, DS= 1.27)
 - Maschi= 81.1 %
-

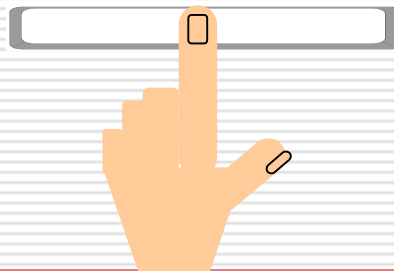
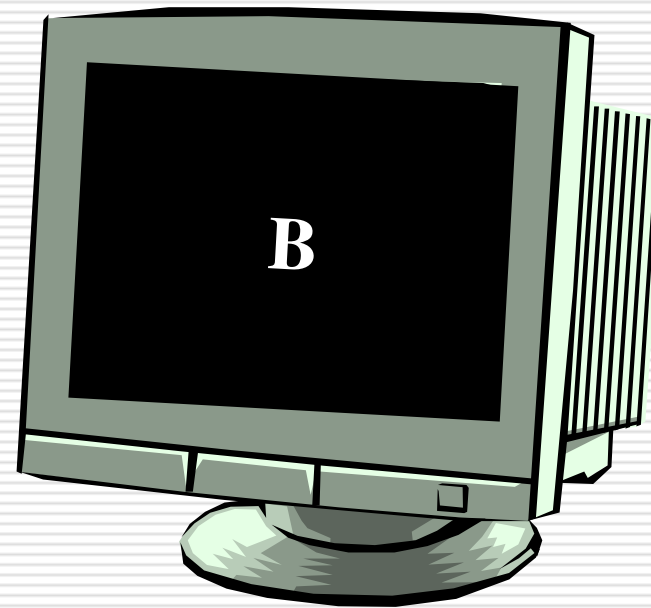
VALUTAZIONE

- QI (> 80)
 - Test di Toulouse
 - Fluenza verbale
 - Torre di Londra
 - CPT
 - Intervista e questionari genitori
-

CONTINUOUS PERFORMANCE TEST

FUNZIONI ESAMINATE:

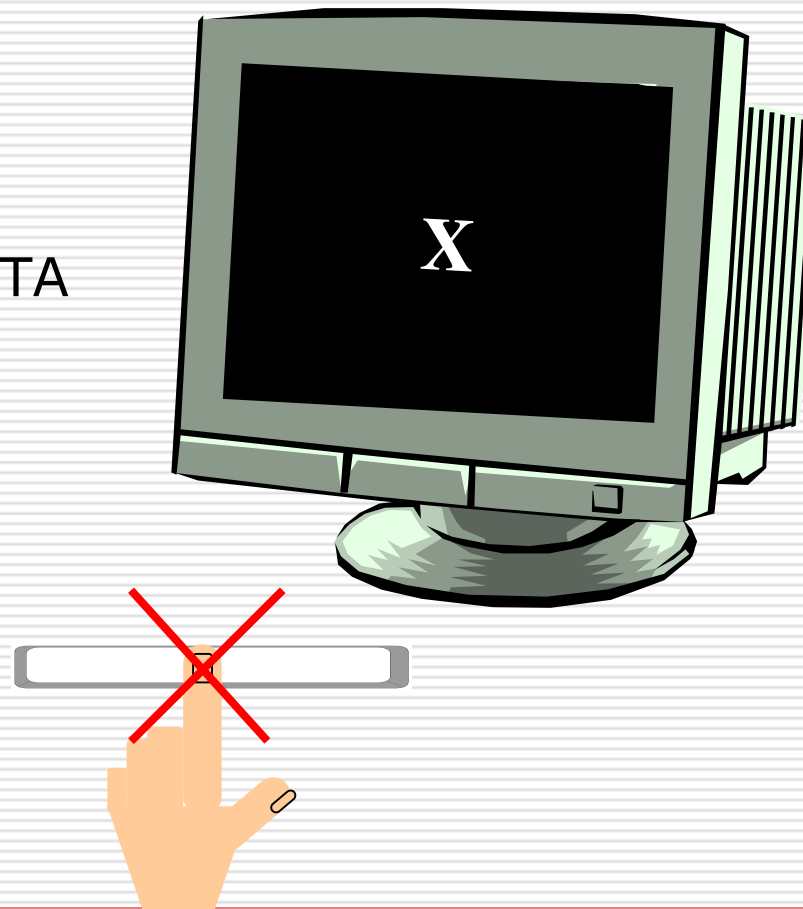
1. ATTENZIONE SOSTENUTA
2. INIBIZIONE (Go-NoGo)



CONTINUOUS PERFORMANCE TEST

FUNZIONI ESAMINATE:

1. ATTENZIONE SOSTENUTA
2. INIBIZIONE (Go-NoGo)

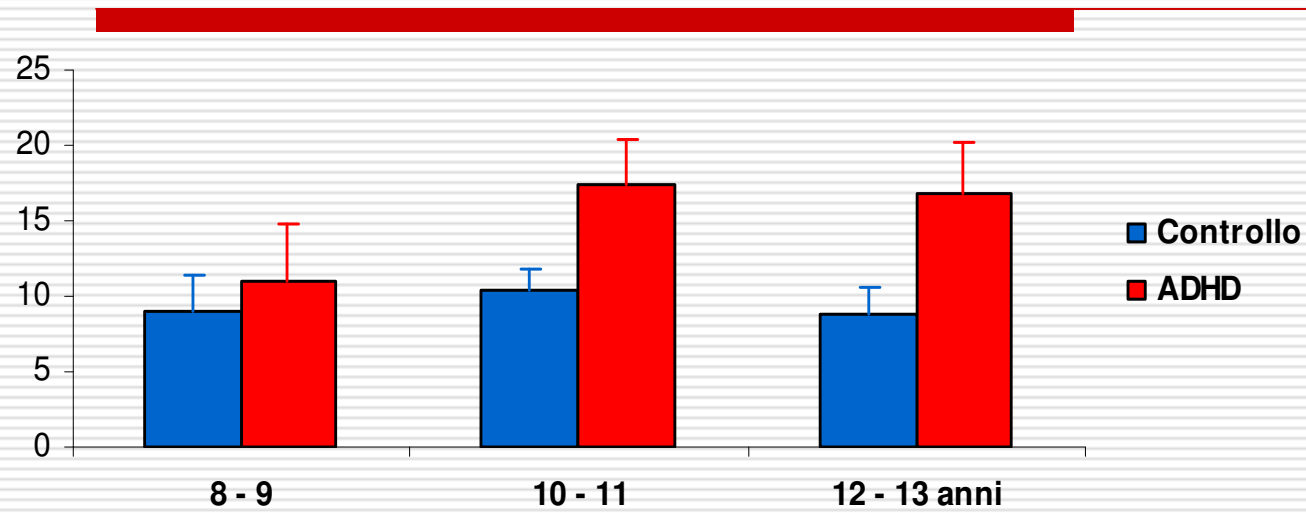


CONTINUOUS PERFORMANCE TEST

- Durata → circa **14 minuti**
 - Totale lettere → 360 (36 "X", **10%**)
 - **6 BLOCCHI**
 - L'INTERVALLO INTER-STIMOLO (**ISI**) (=l'intervallo tra la presentazione di una lettera e la successiva)
variabile: **1, 2 o 4 secondi.**
-

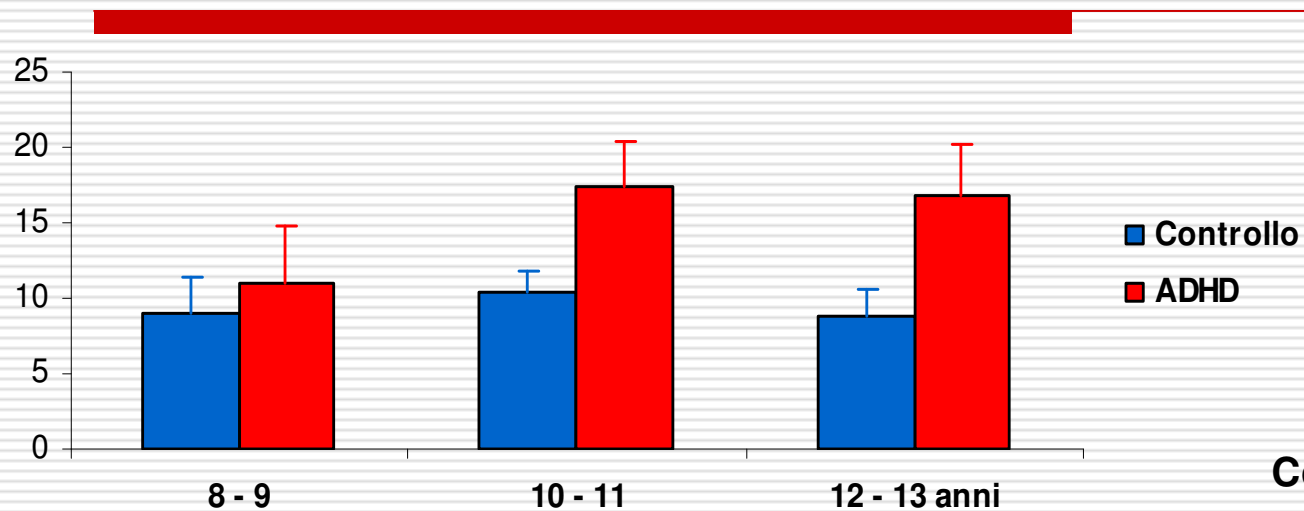
ERRORI

Omissioni (max 324)

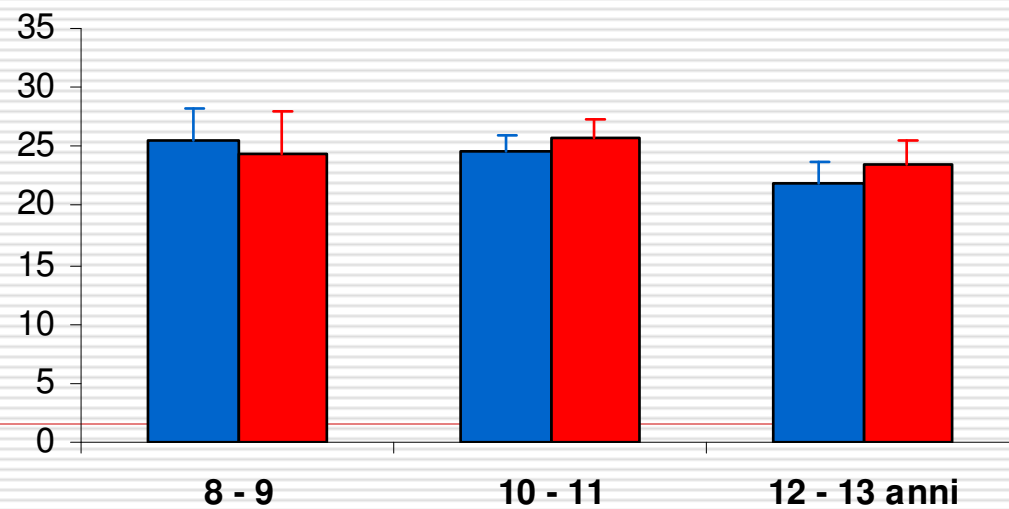


ERRORI

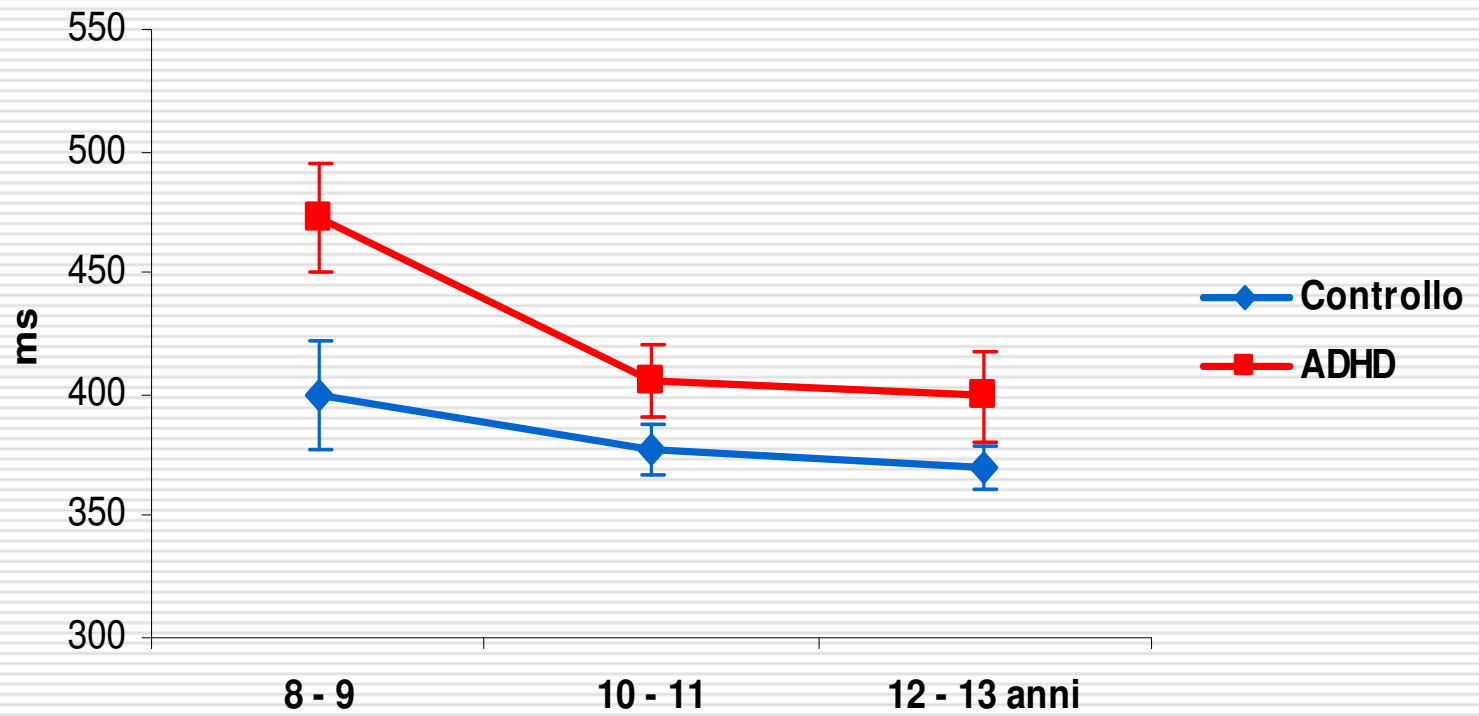
Omissioni (max 324)



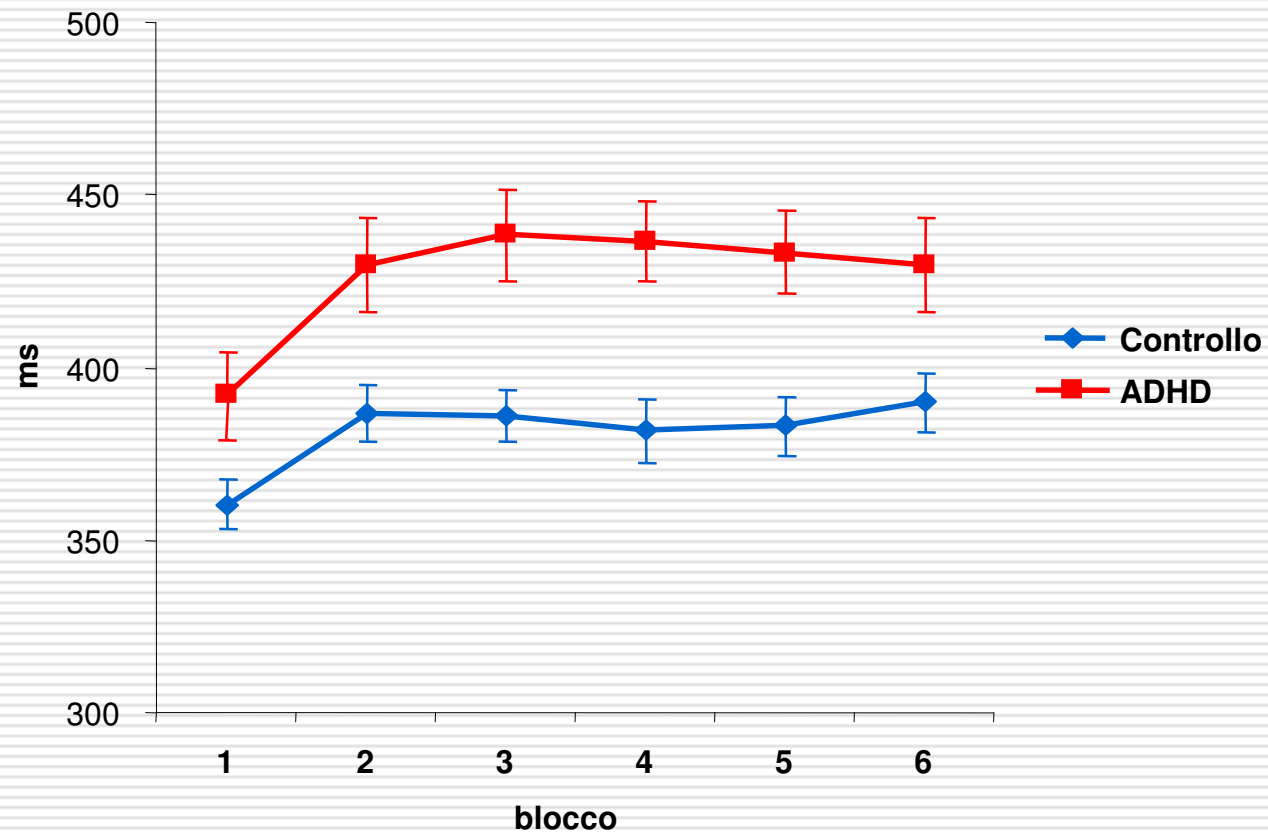
Commissioni (max 36)



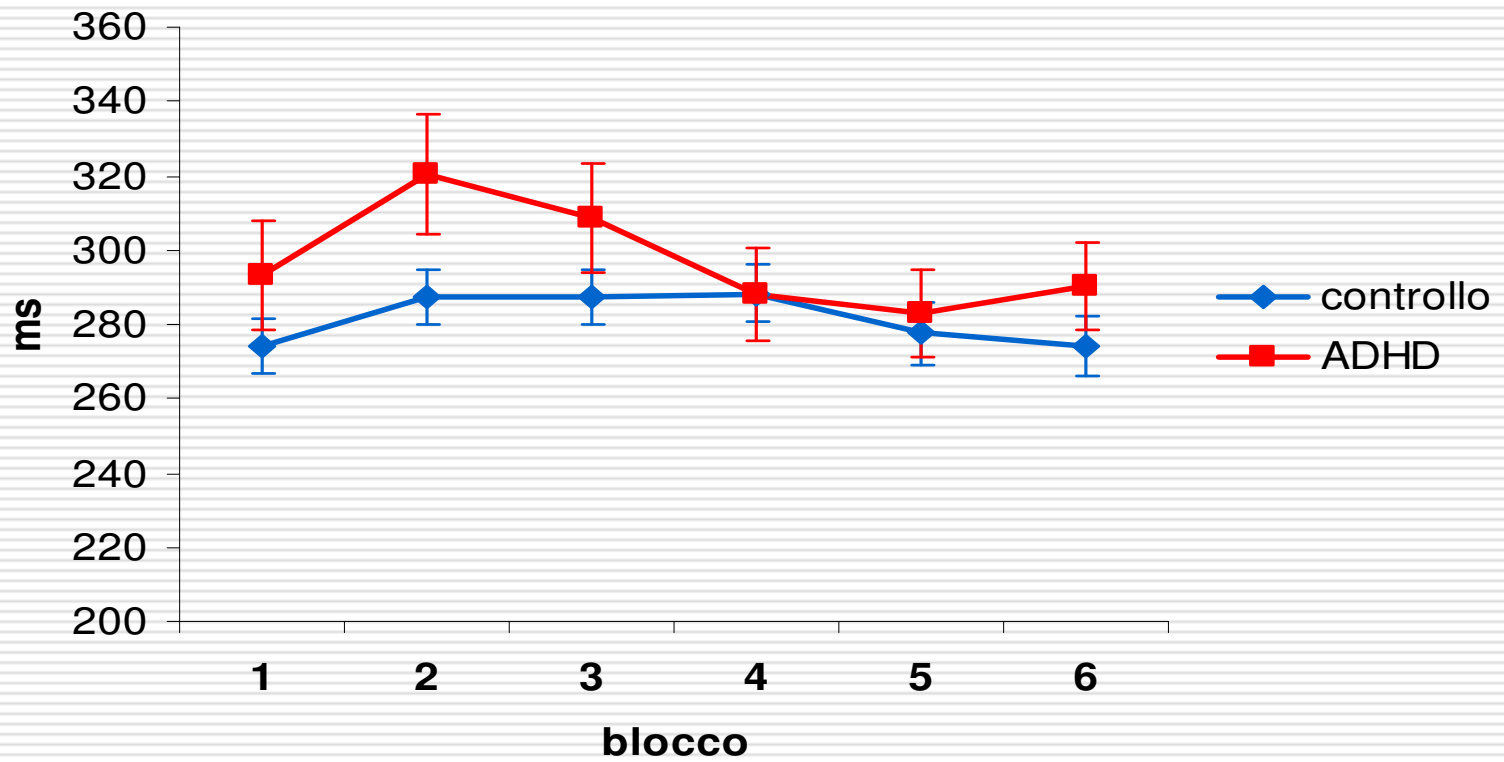
MEDIA TEMPI DI REAZIONE - Totale



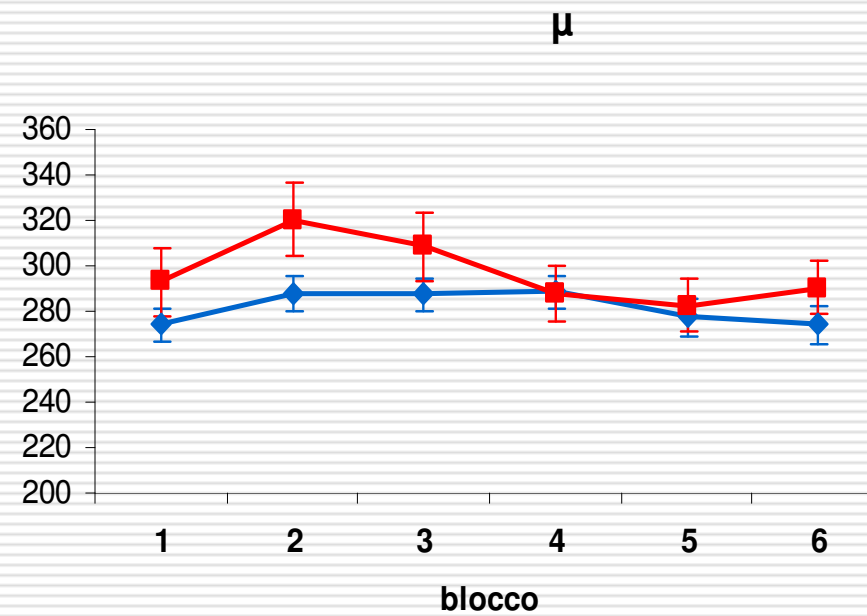
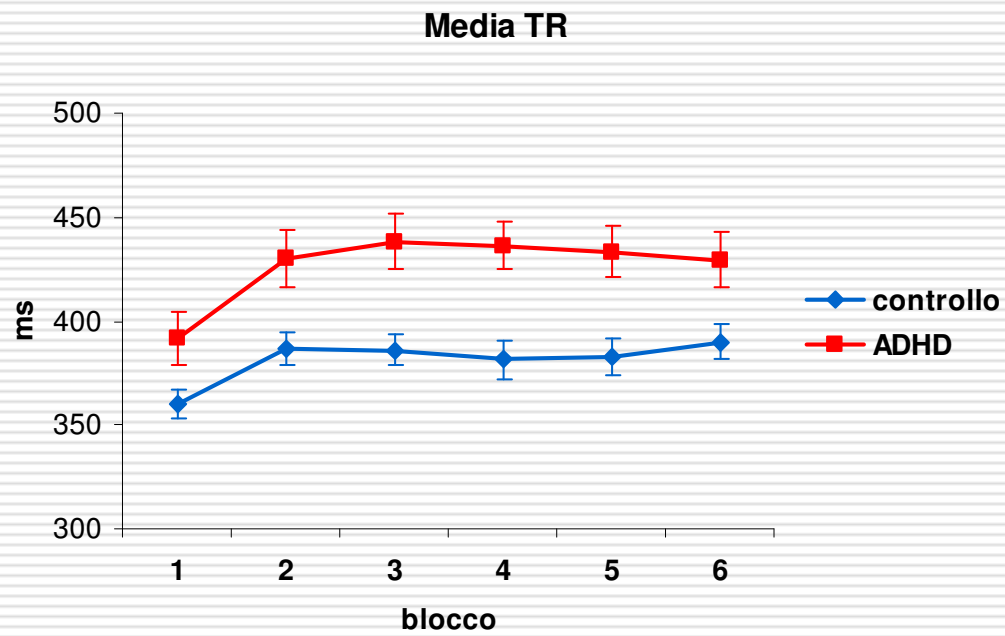
MEDIA TEMPI DI REAZIONE – per blocchi



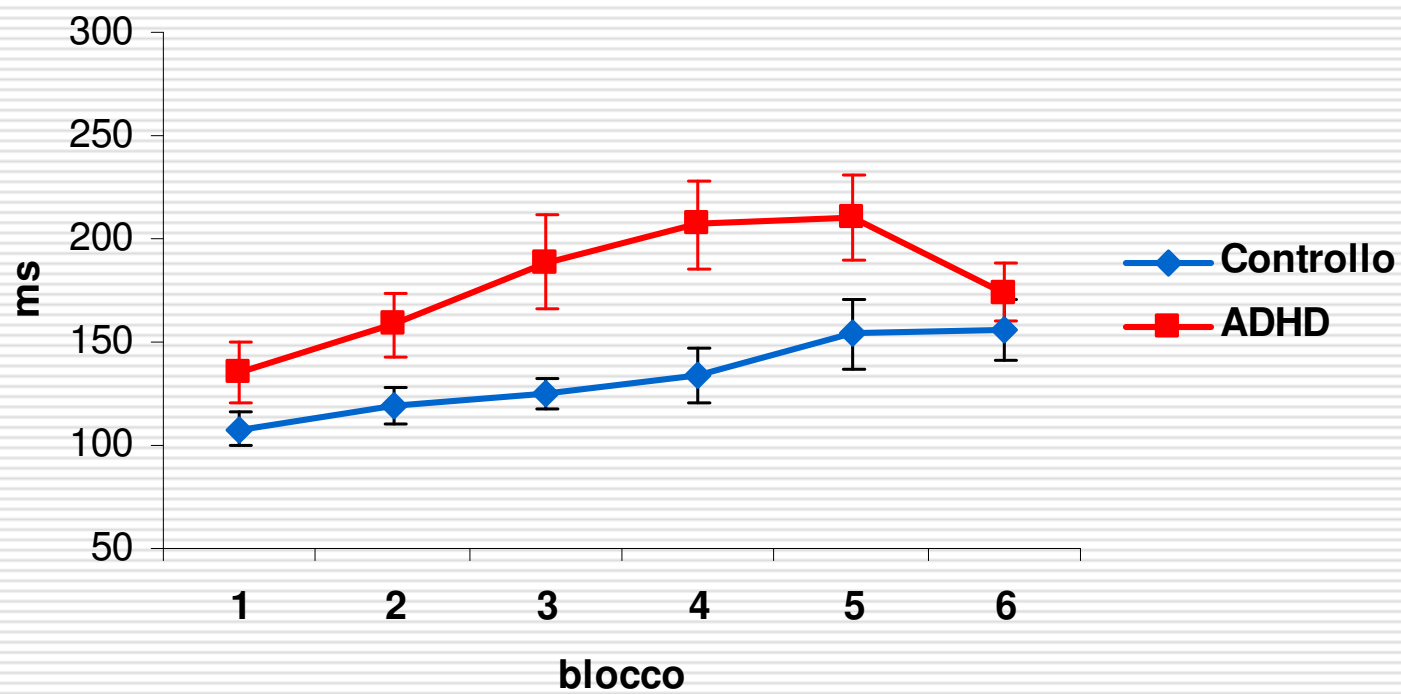
μ - per blocchi



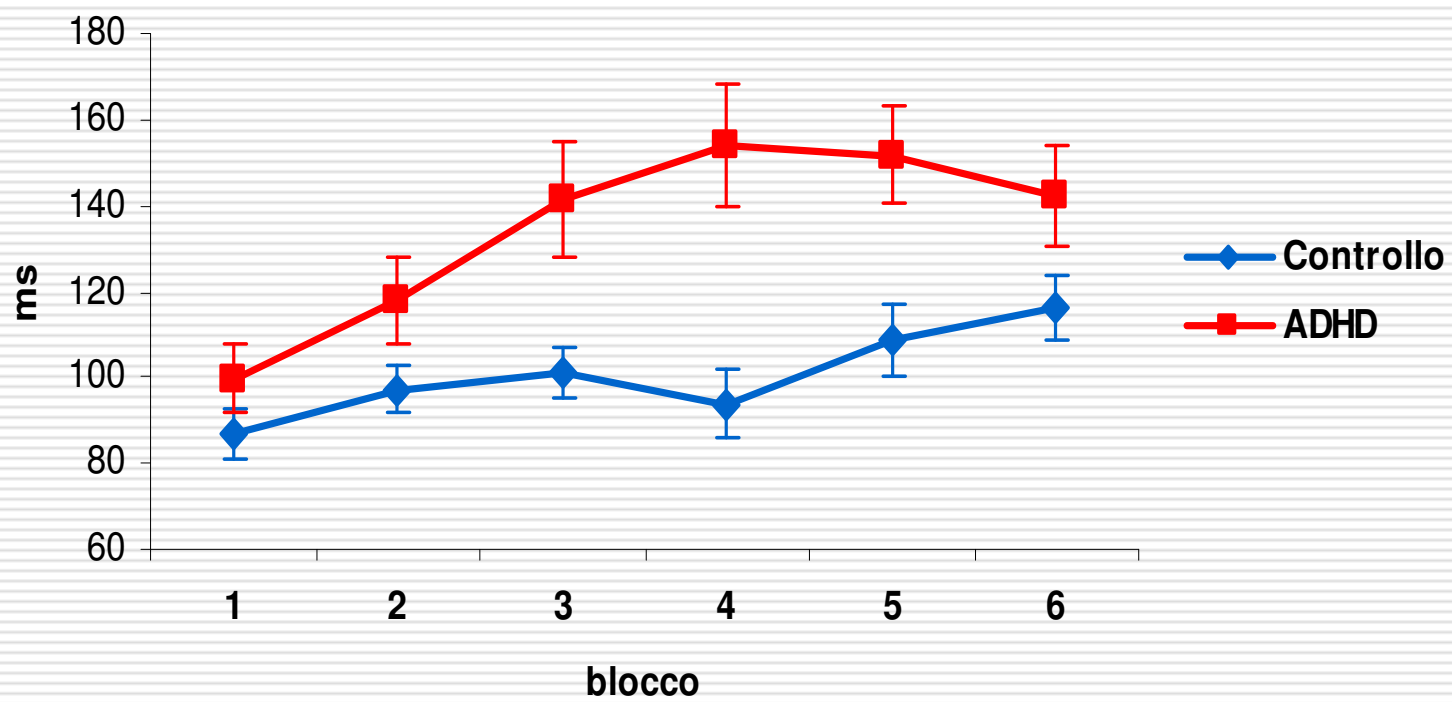
MEDIA E μ A CONFRONTO



DEVIAZIONE STANDARD TR – per blocchi

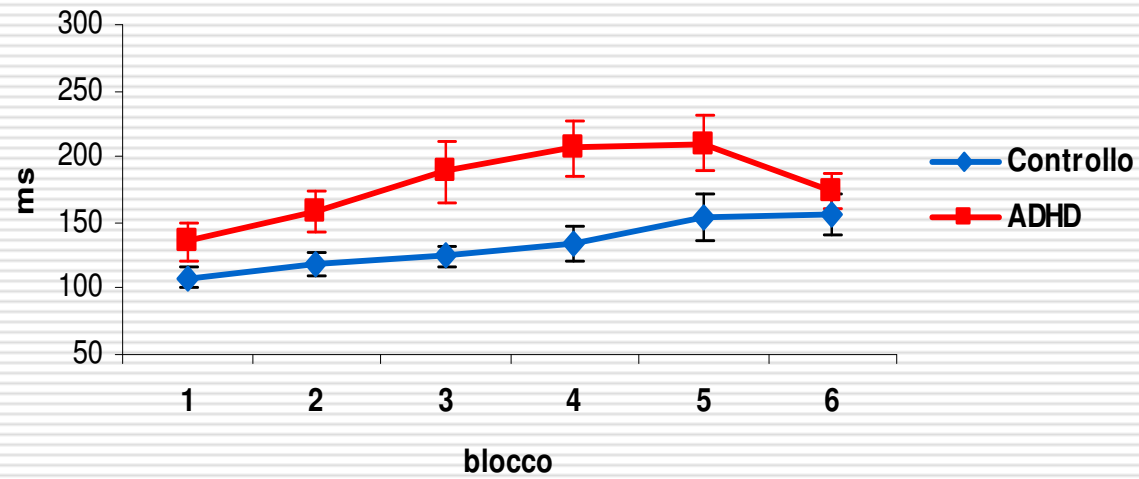


τ - per blocchi

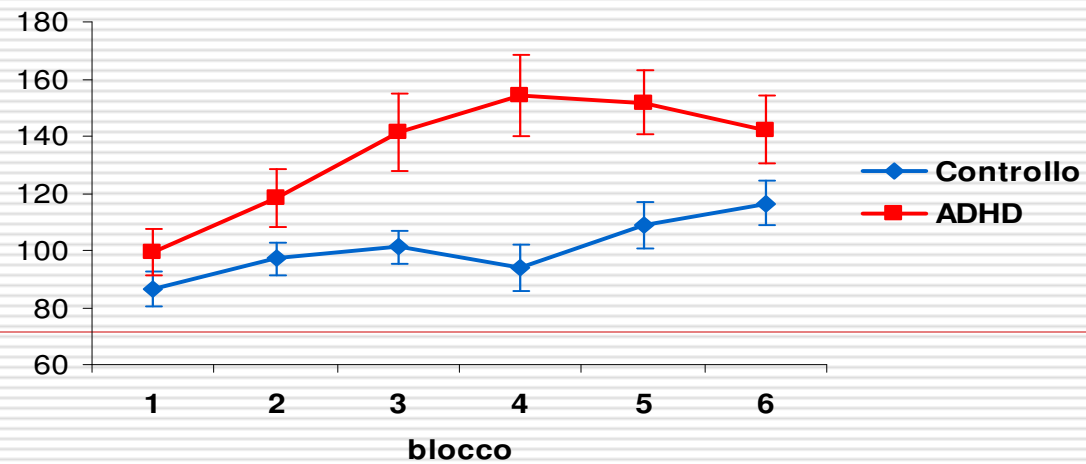


DEVIAZIONE STANDARD E τ A CONFRONTO

DS

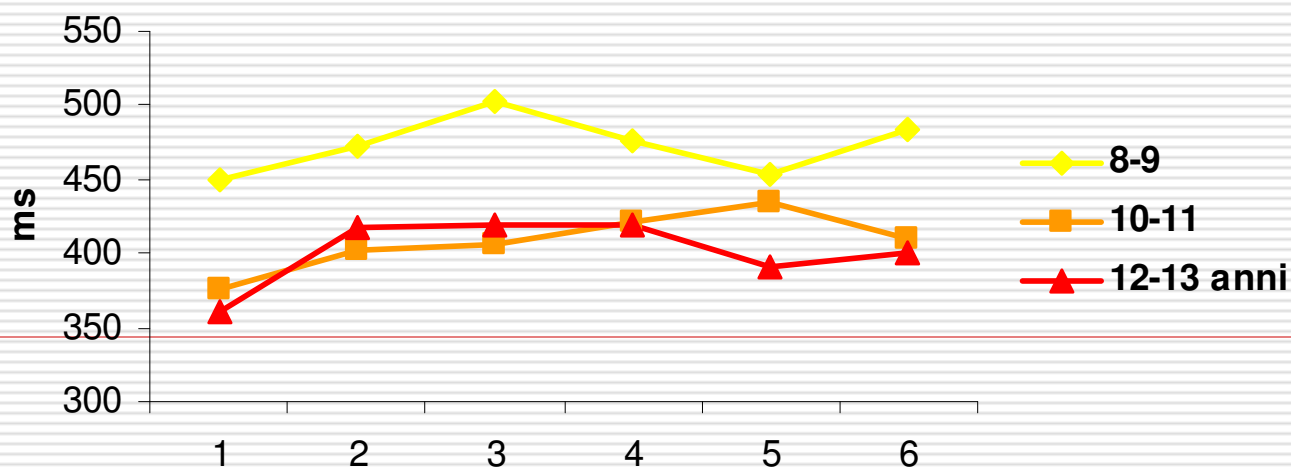
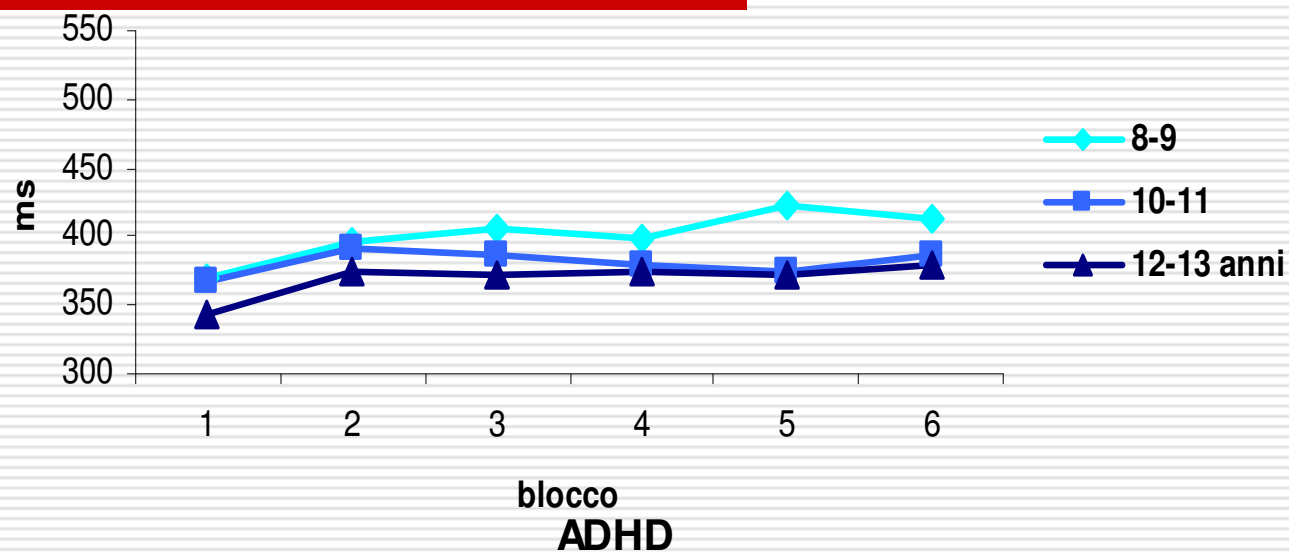


Tau



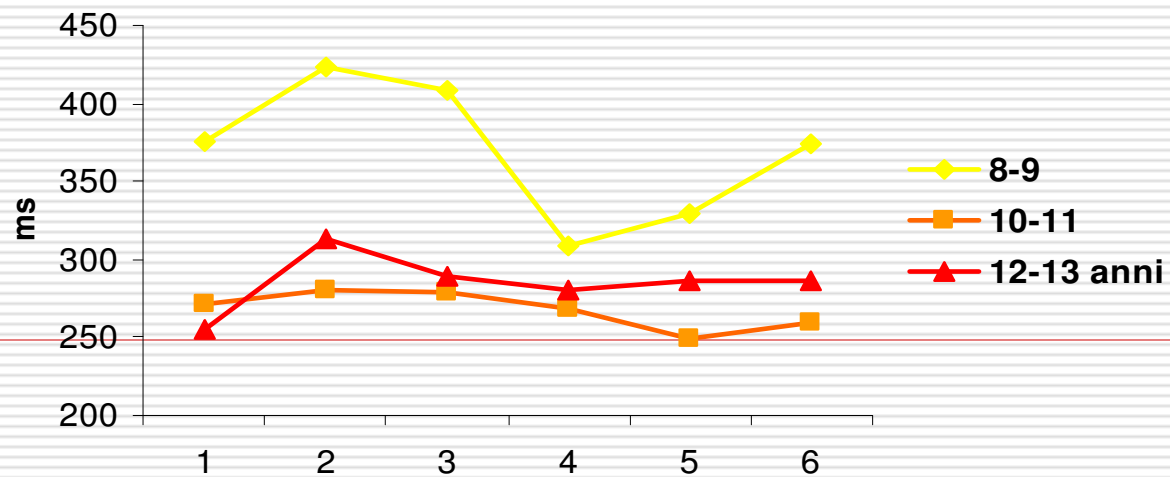
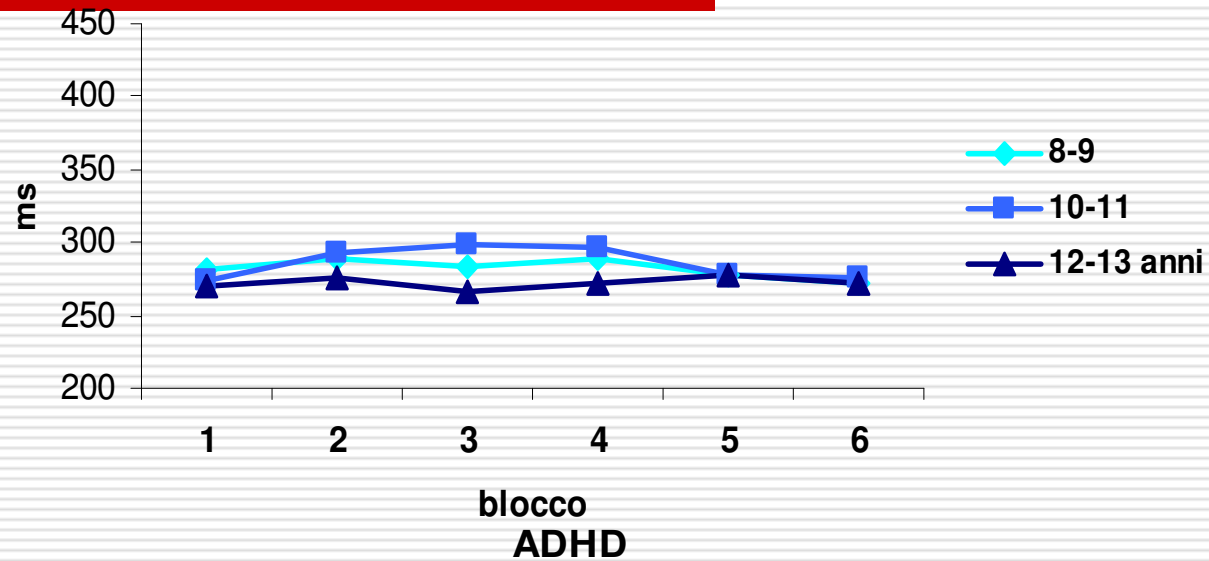
MEDIA TR – per età

Controllo



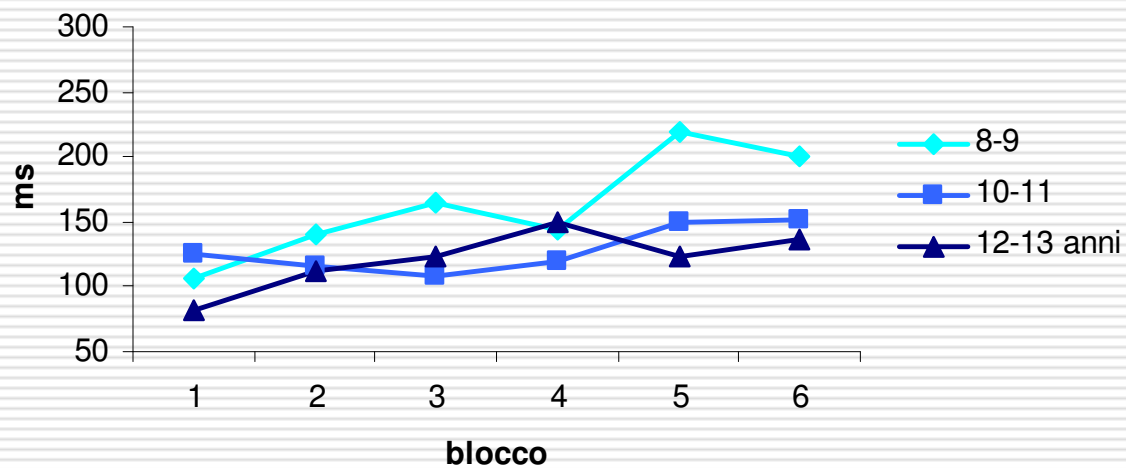
μ - per età

Controllo

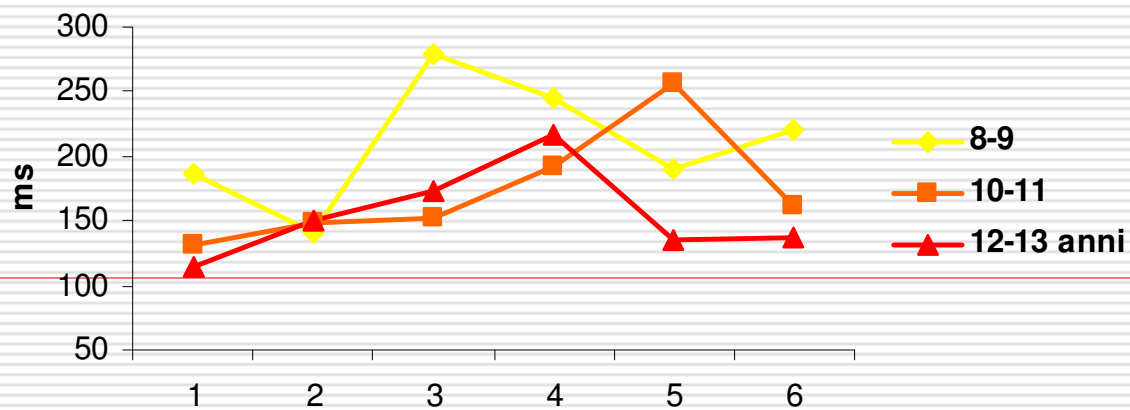


DEVIAZIONE STANDARD TR – per età

Controllo

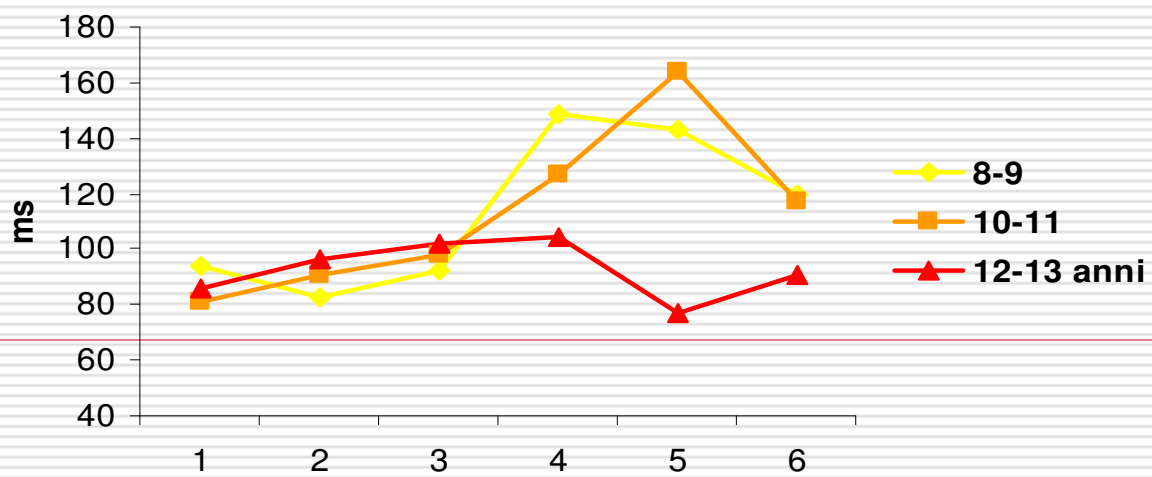
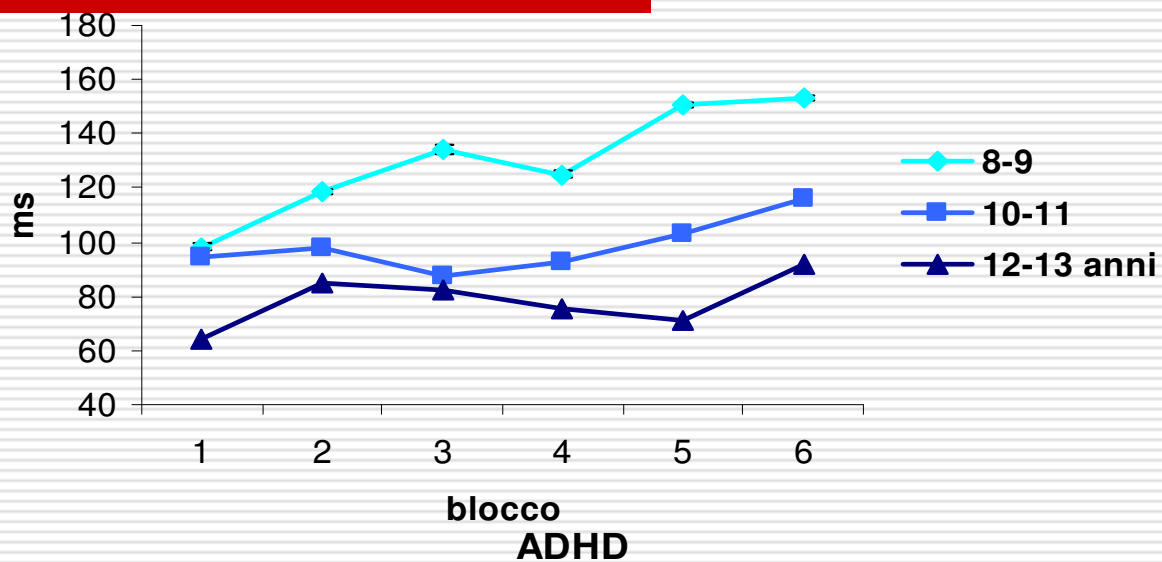


ADHD



τ - per età

Controllo



CONCLUSIONI

- L'analisi ex-gaussiana risulta un utile metodo per
 - Quantificare la variabilità intra-individuale
 - Mettere in luce le differenze evolutive inter-individuali (soprattutto tra ADHD e controllo)
 - Non eliminare i soggetti dalle ricerche come outliers.
-

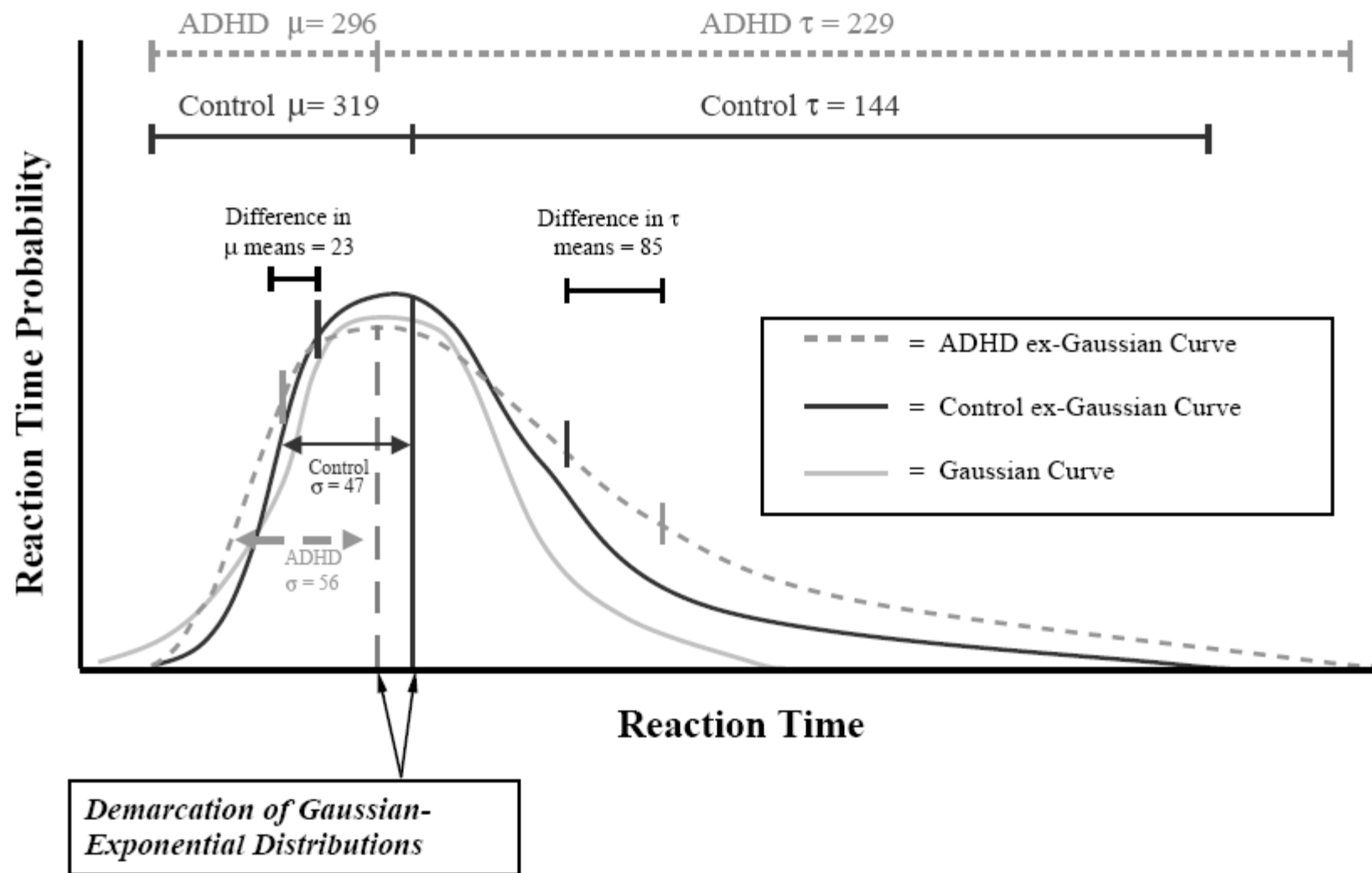
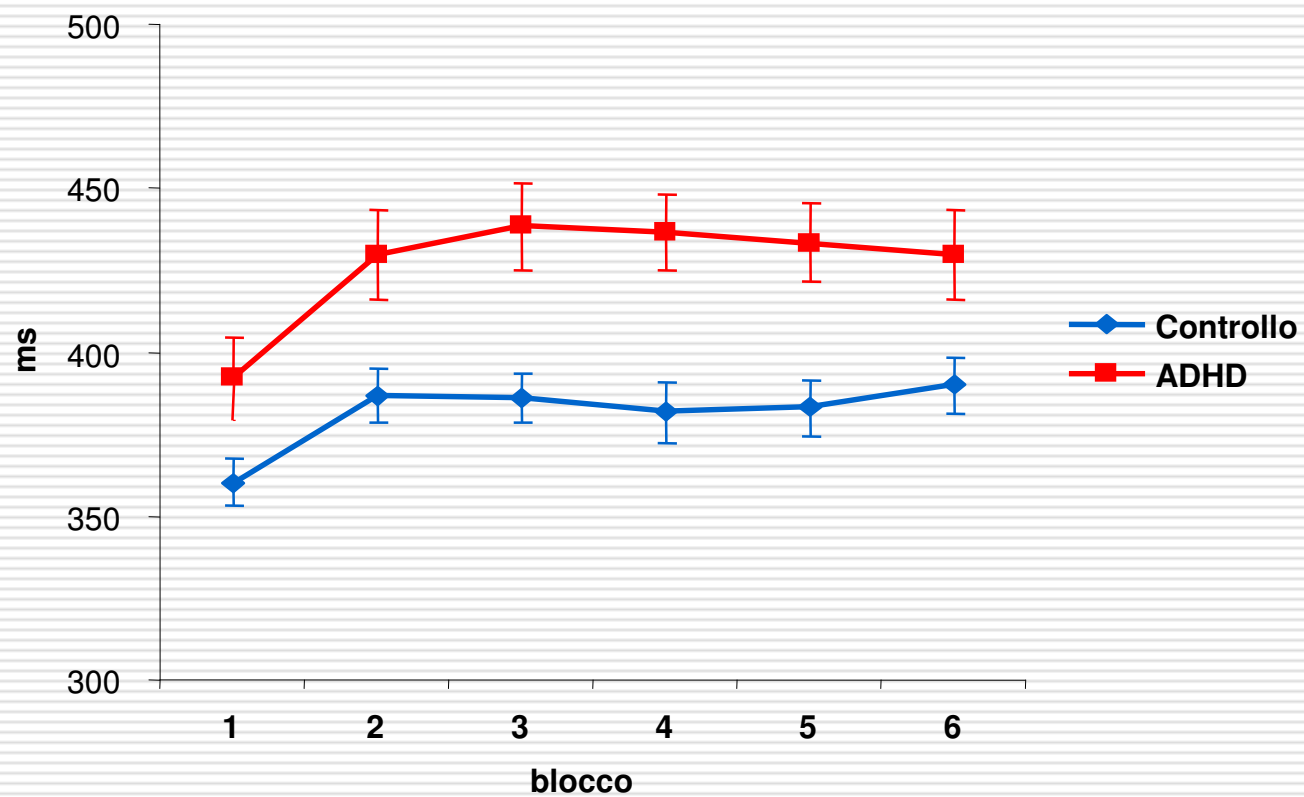
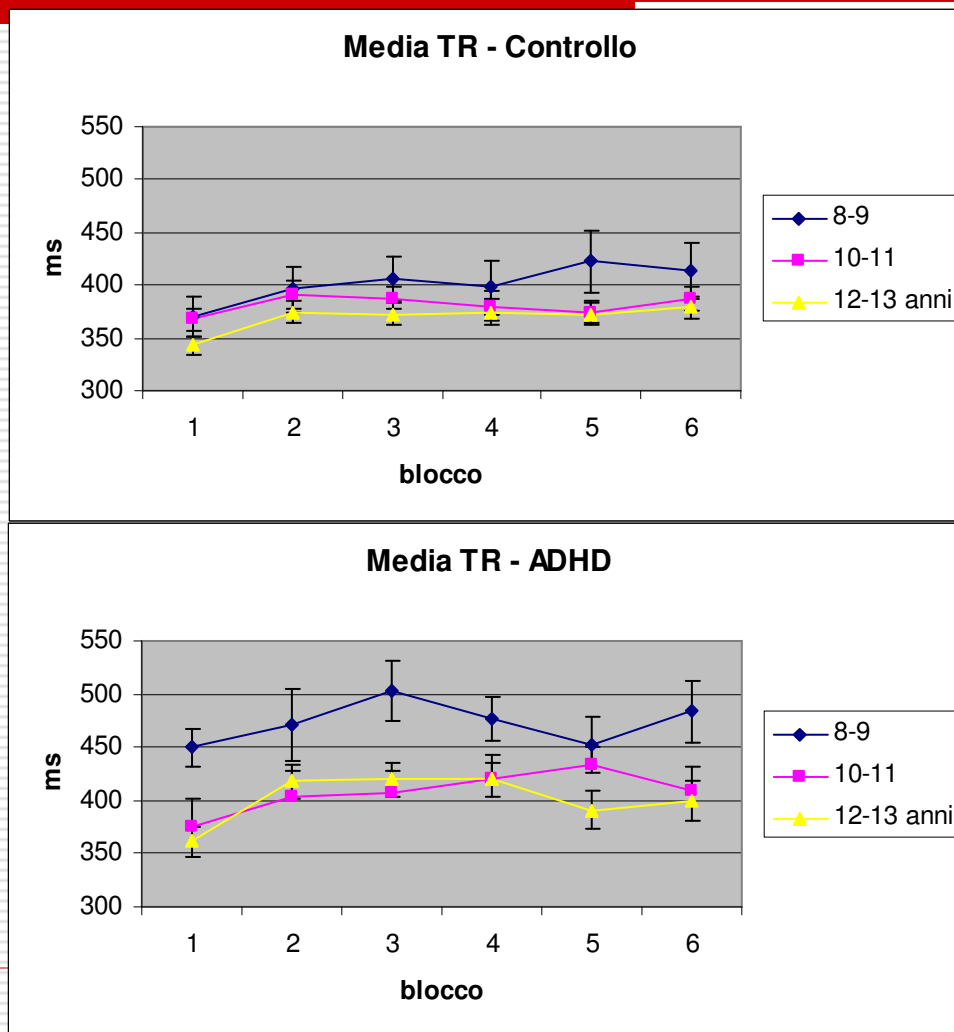


Figure 1 Figure depicting differences in milliseconds between ADHD and LNCG groups on the ex-Gaussian variables μ , σ , and τ .

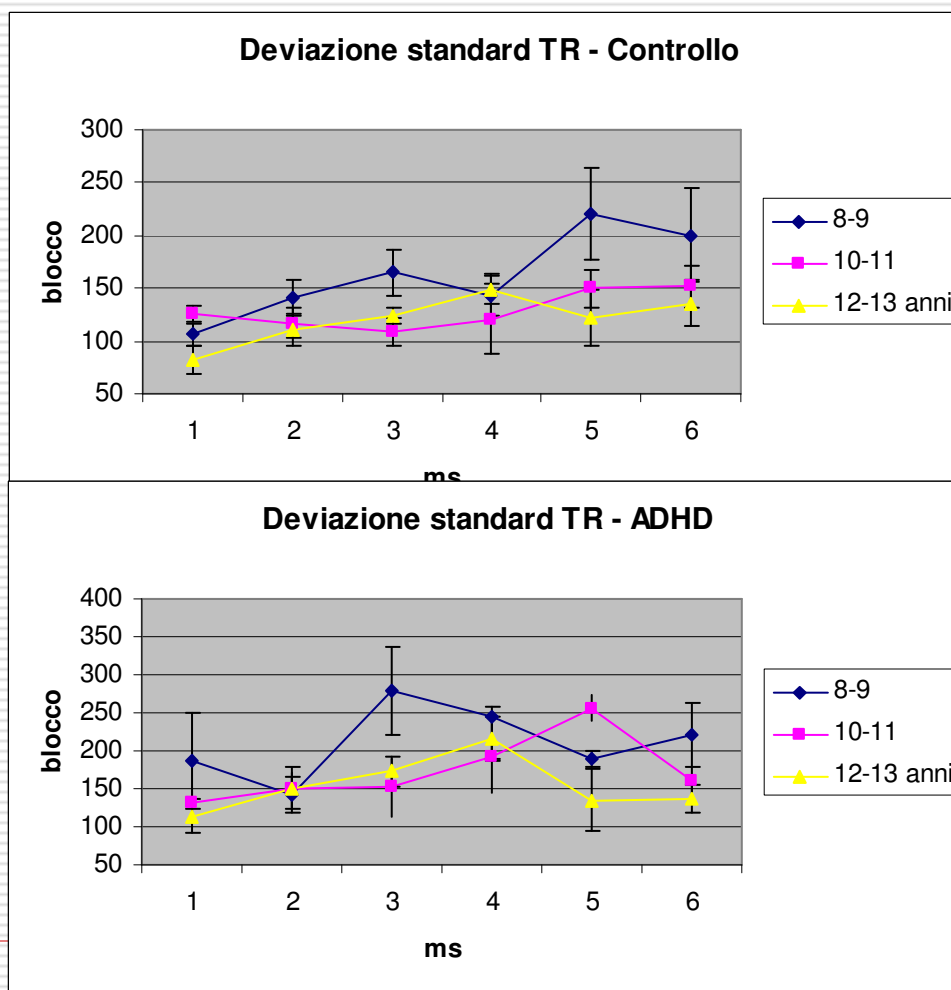
MEDIA TEMPI DI REAZIONE – per blocchi



MEDIA TR – per età



DEVIAZIONE STANDARD TR – per età



Heathcote, Popiel, and Mewhort (1991)

- ~~□ Analisi dei TR in un compito di Stroop~~
 - Incremento di entrambi i parametri μ e τ nella condizione di incongruenza rispetto a quella di controllo
 - Decremento di μ e **incremento di τ** nella condizione di congruenza (→ effetto mascherato dall'analisi della media).
-

Spieler, Balota, and Faust (1991)

- ~~Analisi dei TR in un compito di Stroop~~ confronto tra soggetti giovani, anziani e con Demenza di Alzheimer
 - τ aumenta selettivamente nei soggetti anziani e con AD,
 - dunque questo parametro riflette l'efficienza dei processi inibitori (“stadio di elaborazione centrale”).
 - Il parametro μ riflette uno “stadio di elaborazione periferica” (motoria).
-

West, Murphy, Armilio, Craik, and Stuss (2002)

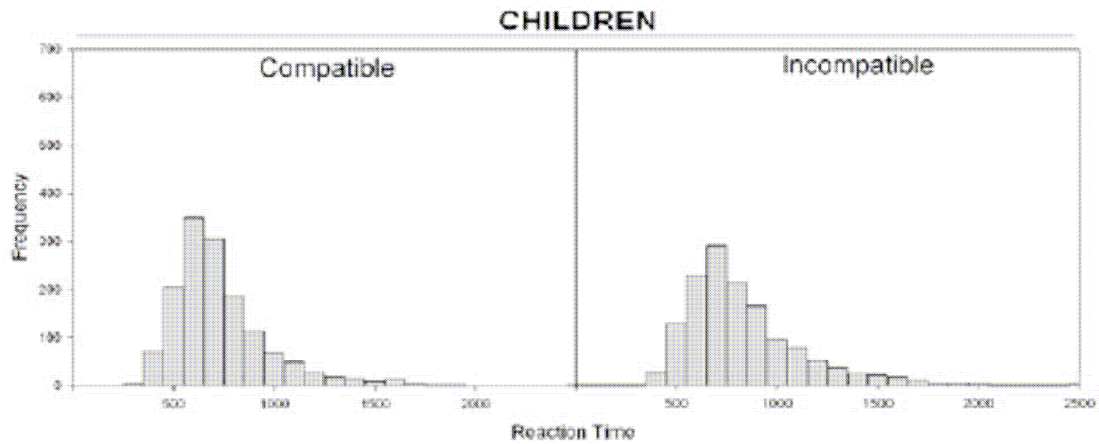
- *1-back was administered to young and older adults across multiple test sessions.*
- *Using conventional analyses, it was shown that the performance of older adults was more variable than that of young adults.*
- *By conducting ex-Gaussian analyses, West et al. demonstrated that the age-related increase in performance variability was related to greater skew in the RT distribution of older adults.*
- *These results led to the conclusion that performance variability is increased in older adults because of **transient periods of inefficient executive control**.*
- *As this research exemplifies, the ex-Gaussian approach facilitated a **deeper understanding of cognitive changes related to adult aging and in understanding changes in cognition that occur during childhood**.*

DEVELOPMENTAL NEUROPSYCHOLOGY, 29(3), 447–458
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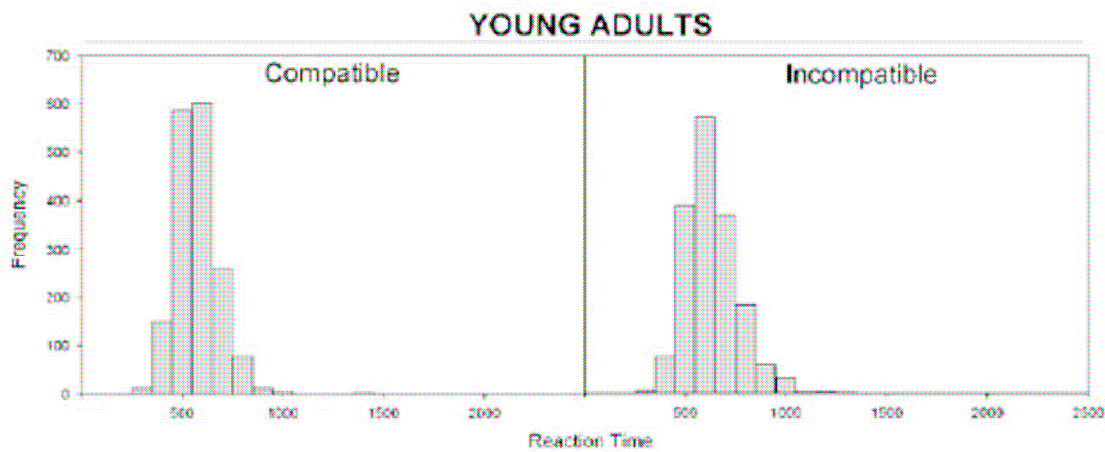
Revisiting Inhibitory Control Across the Life Span: Insights From the Ex-Gaussian Distribution

Tara McAuley, Melvin Yap, Shawn E. Christ, and
Desirée A. White
*Department of Psychology
Washington University
St. Louis, MO*

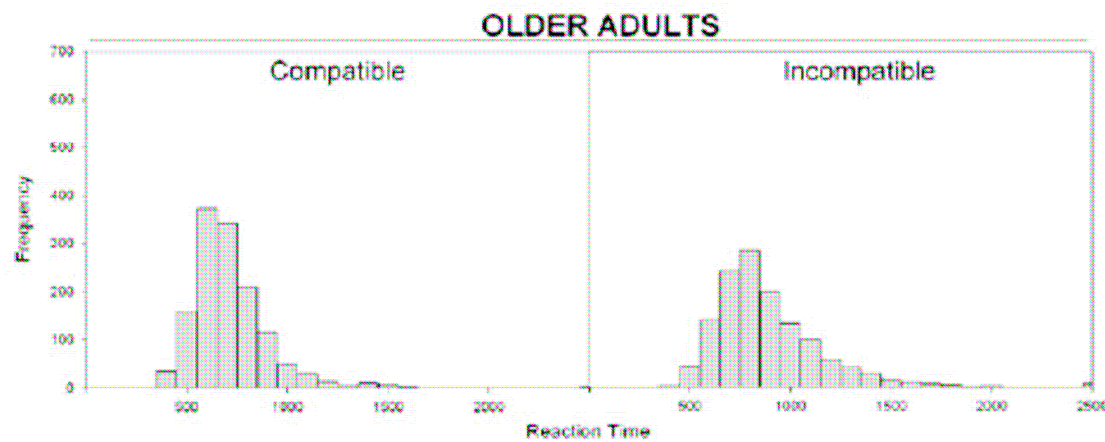
In conclusion, the ex-Gaussian approach offers a number of pragmatic advantages. The chief advantage, however, is increased interpretive power. By decomposing measures of central tendency, it is possible to determine whether the effects of experimental manipulations are attributable to shift (μ), spread (σ), or skew (τ) in RT distributions. Thus, the ex-Gaussian approach provides a tool for analyzing RT data at a finer level of detail than is possible using more conventional analytic strategies. This approach may particularly enrich researchers' understanding of relatively subtle changes in performance that occur across the life span.



n= 37, 6-15 yrs



n= 43, 17-22 yrs



n= 33, 61-82 yrs

Mean Values for Each Age Group as a Function of the Experimental Condition

| <i>Group</i> | <i>Compatible</i> | | | | | <i>Incompatible</i> | | | | |
|--------------|-------------------|-----------|-------|----------|--------|---------------------|-----------|-------|----------|--------|
| | <i>M</i> | <i>SD</i> | μ | σ | τ | <i>M</i> | <i>SD</i> | μ | σ | τ |
| Child | 696 | 176 | 545 | 58 | 150 | 788 | 190 | 622 | 66 | 169 |
| Young adult | 528 | 78 | 471 | 36 | 55 | 584 | 88 | 511 | 38 | 73 |
| Older adult | 664 | 143 | 549 | 42 | 113 | 828 | 173 | 689 | 83 | 139 |

ble to those of young adults; sigma, however, was different. Thus, inhibitory changes in older adults were due to slower, more variable, and more extreme responding. Inhibitory changes in children were due only to more variable responding. These findings suggest that different mechanisms underlie age-related changes in inhibitory control during different epochs of the life span. This study demonstrates that the ex-Gaussian approach provides a finer level of analysis than data analytic approaches typically used in neuropsychological research.