



# REACTION TIME OF ELITE SPRINTERS

*Implications of the false starts disqualification rule*



# OBJECTIVES...

## **Objective 1:**

Utilising the collected data can we:

- identify that the sprint start reaction times have changed after a rule change, and
- is there sufficient difference to suggest that rule change reduces risk taken.

## **Objective 2:**

Utilising the collected data and the extensive literature can we:

- identify that the sprint start reaction time false start limit is no longer valid, and
- can we estimate a more appropriate value for use in competitive athletics.

# LITERATURE REVIEW...

MEDICINE AND SCIENCE IN SPORTS AND EXERCISE  
Copyright © 1986 by the American College of Sports Medicine

Printed in U.S.A.

## ORIGINAL INVESTIGATIONS

# Electro-mechanical response times and rate of force development in males and females

DOUGLAS G. BELL and IRA JACOBS



# LITERATURE REVIEW...

*Behavior Research Methods, Instruments, & Computers*  
1988, 20 (1), 54-57

## Fitting the ex-Gaussian equation to reaction time distributions

MICHAEL R. W. DAWSON  
*University of Alberta, Edmonton, Alberta, Canada*



# LITERATURE REVIEW...

European  
Journal of **Applied  
Physiology**  
and Occupational Physiology  
© Springer-Verlag 1990

## **Reaction time and electromyographic activity during a sprint start**

**Antti Mero and Paavo V. Komi**





# LITERATURE REVIEW...

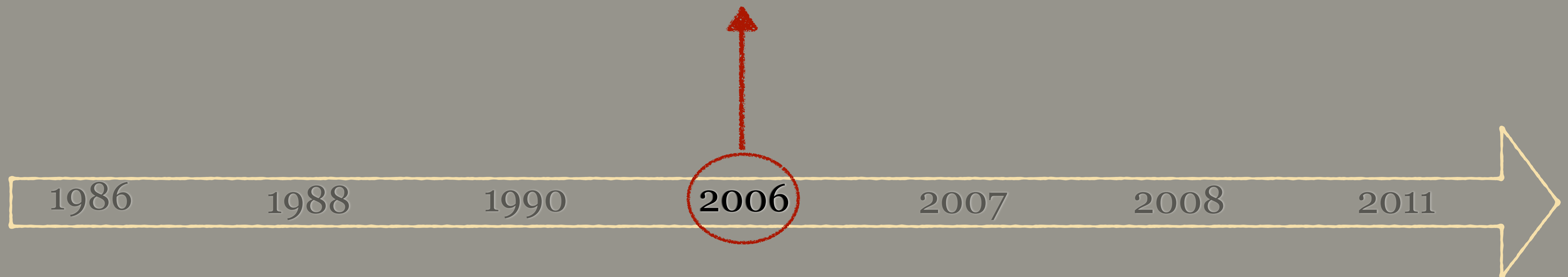
Psychology and Aging  
2006, Vol. 21, No. 1, 62–73

Copyright 2006 by the American Psychological Association  
0882-7974/06/\$12.00 DOI: 10.1037/0882-7974.21.1.62

## Age and Sex Differences in Reaction Time in Adulthood: Results From the United Kingdom Health and Lifestyle Survey

Geoff Der  
University of Glasgow

Ian J. Deary  
University of Edinburgh



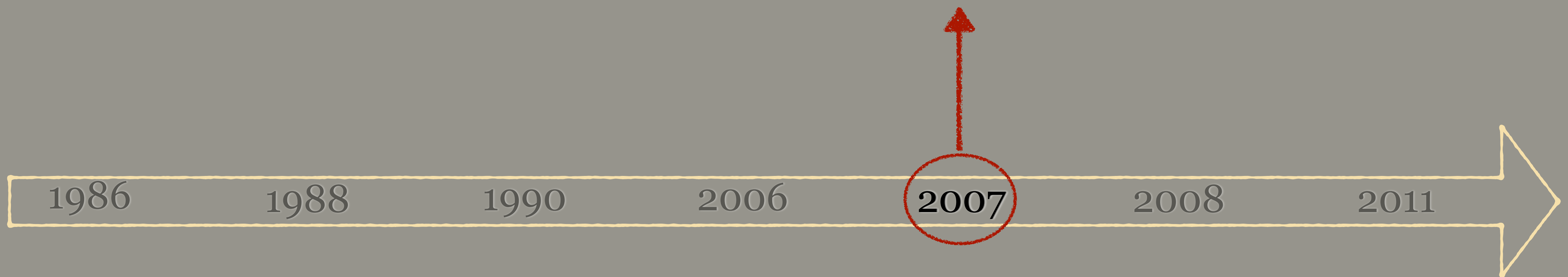
# LITERATURE REVIEW...

*Journal of Sports Sciences*, January 1st 2007; 25(1): 79 – 86

 **Routledge**  
Taylor & Francis Group

## **Sprint starts and the minimum auditory reaction time**

MATTHEW T. G. PAIN<sup>1</sup> & ANGELA HIBBS<sup>2</sup>



# LITERATURE REVIEW...

*Physical Fitness and Performance*

## **“Go” Signal Intensity Influences the Sprint Start**

ALEXANDER M. BROWN<sup>1</sup>, ZOLTAN R. KENWELL<sup>1</sup>, BRIAN K.V. MARAJ<sup>1,2</sup>, and DAVID F. COLLINS<sup>1,2</sup>





# LITERATURE REVIEW...

OPEN ACCESS Freely available online



## On the Implications of a Sex Difference in the Reaction Times of Sprinters at the Beijing Olympics

David B. Lipps<sup>1</sup>, Andrzej T. Galecki<sup>2,3</sup>, James A. Ashton-Miller<sup>1,3,4,5\*</sup>

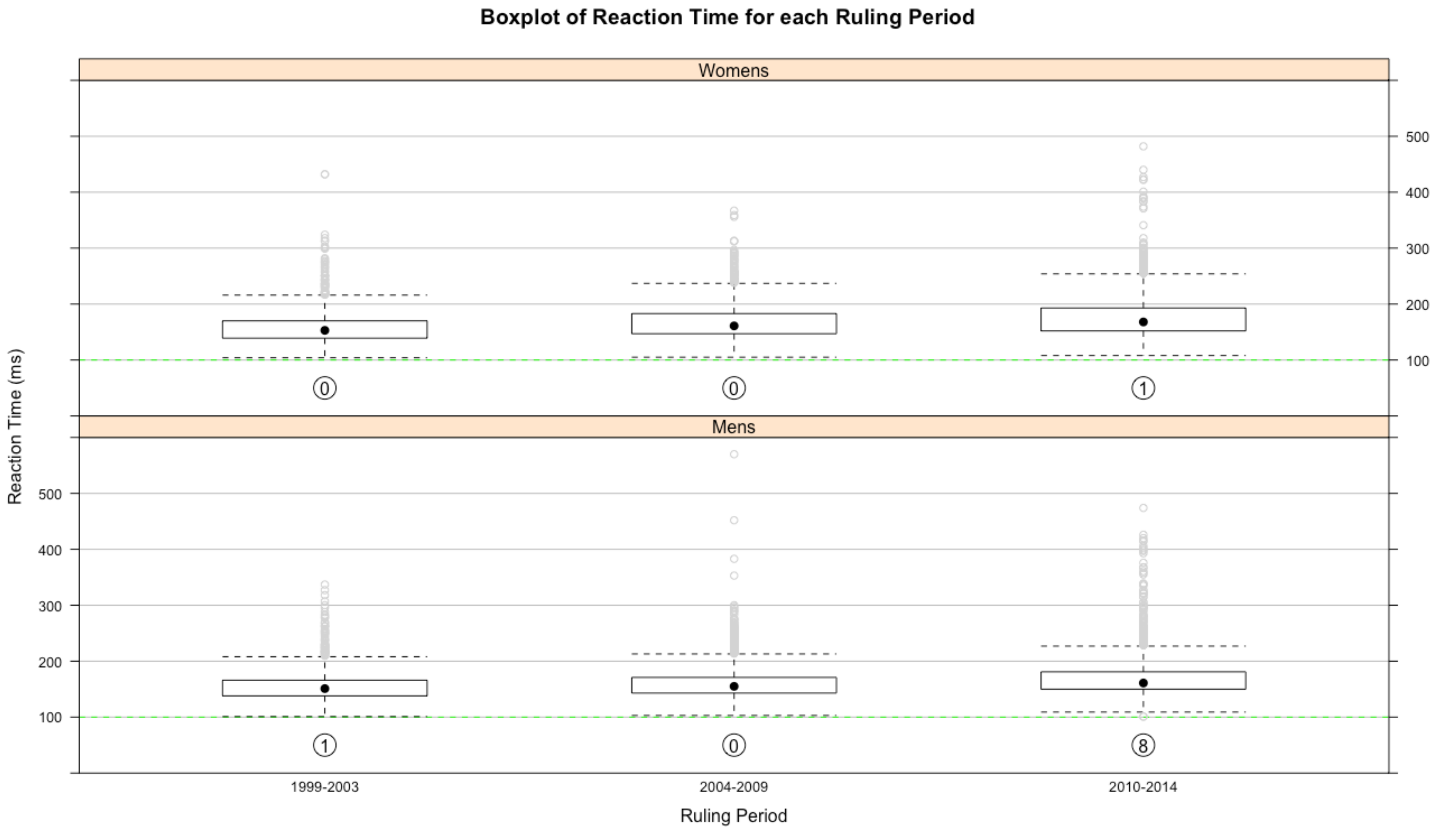


# REACTION TIME DATA...

Descriptive statistics for elite sprinter reaction times (ms).

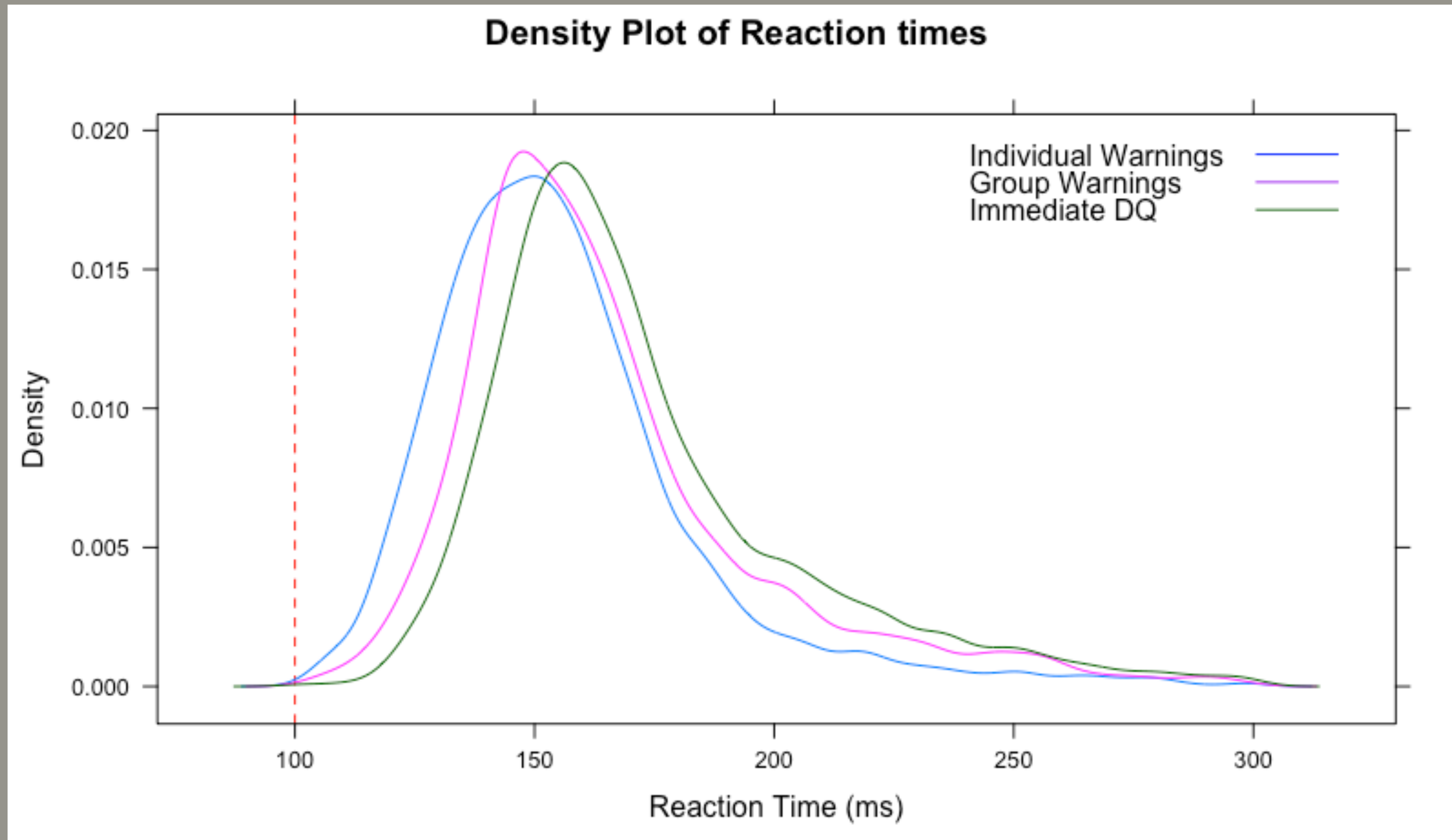
Gender		N	Median	95% CI	No. False Starts
Male	1999 – 2003	1407	151.0	(116.0, 230.0)	1
	2004 – 2009	1545	155.0	(121.0, 250.0)	0
	2010 – 2014	1608	161.0	(128.0, 282.7)	8
Female	1999 – 2003	1160	153.0	(119.0, 244.0)	0
	2004 – 2009	1237	161.0	(126.2, 256.8)	0
	2010 – 2014	1602	168.0	(130.0, 278.0)	1
Total		8559	159.0	(122.0, 259.0)	10

# REACTION TIME DATA...



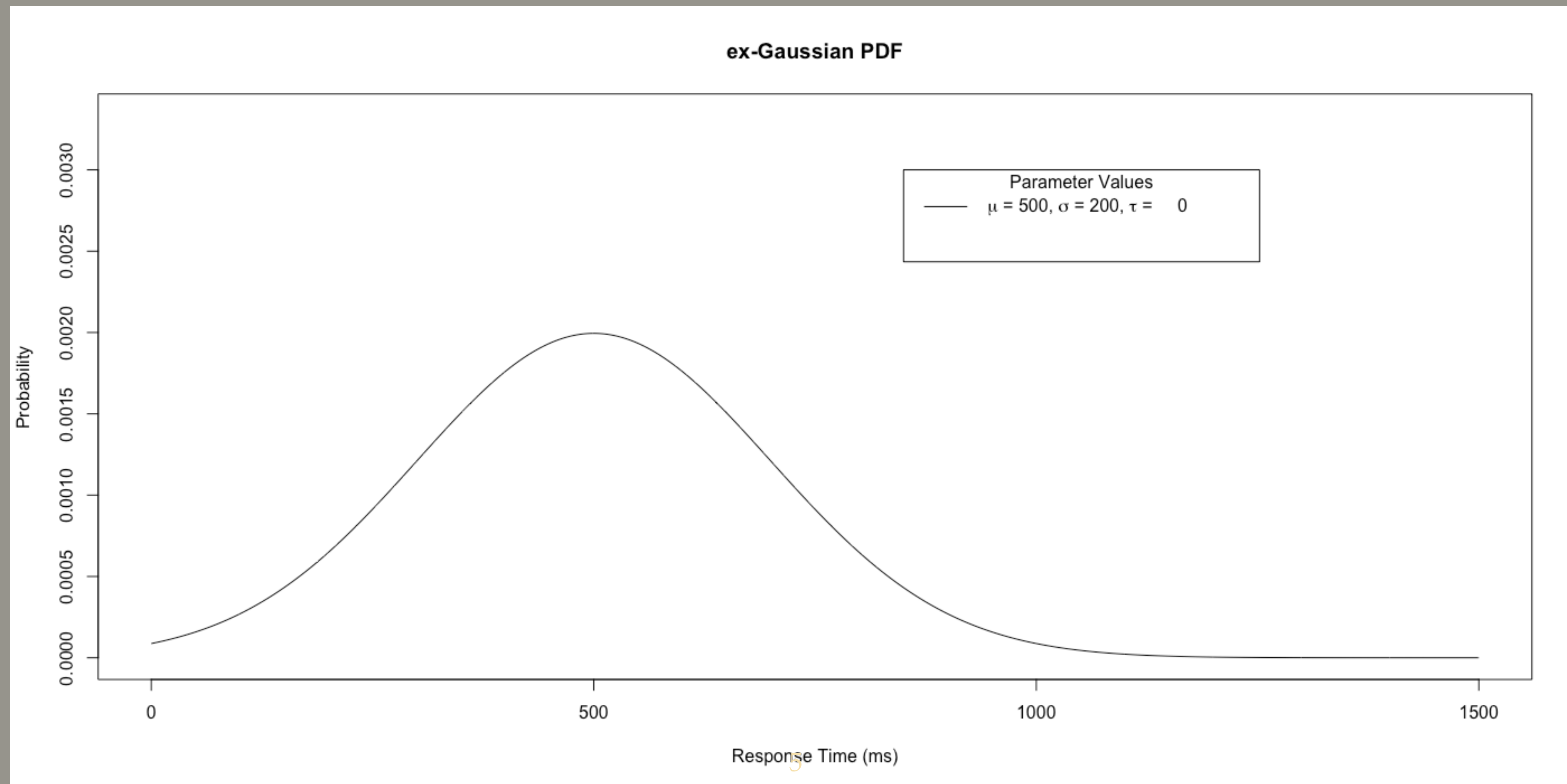


# REACTION TIME DATA...



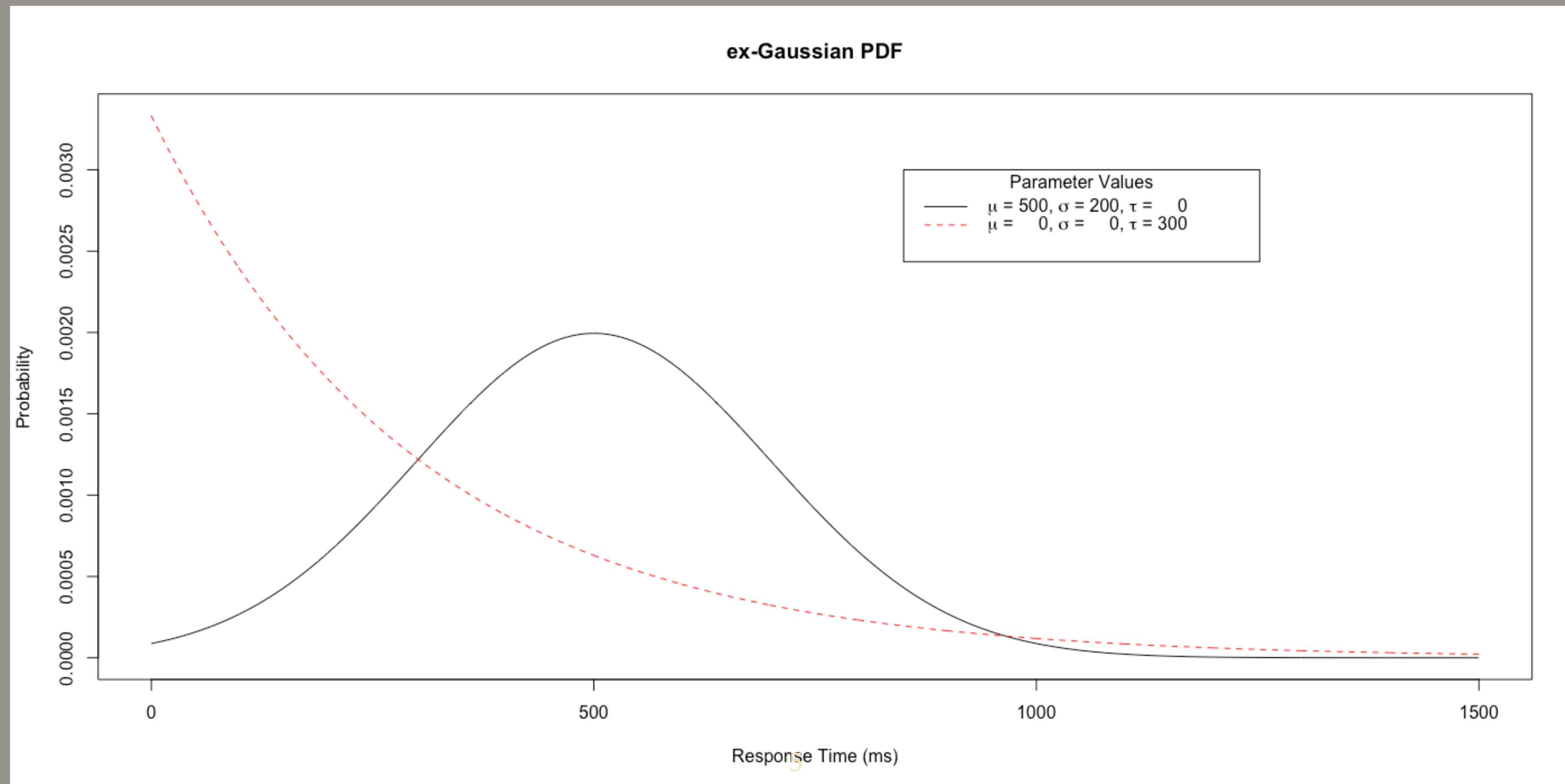
# EX-GAUSSIAN DISTRIBUTION...

$$f(x|\mu, \sigma, \tau) = \frac{1}{\tau} e^{\left(\frac{\mu}{\tau} + \frac{\sigma^2}{2\tau^2} - \frac{x}{\tau}\right)} \Phi\left(\frac{x - \mu - \frac{\sigma^2}{\tau}}{\sigma}\right)$$



# EX-GAUSSIAN DISTRIBUTION...

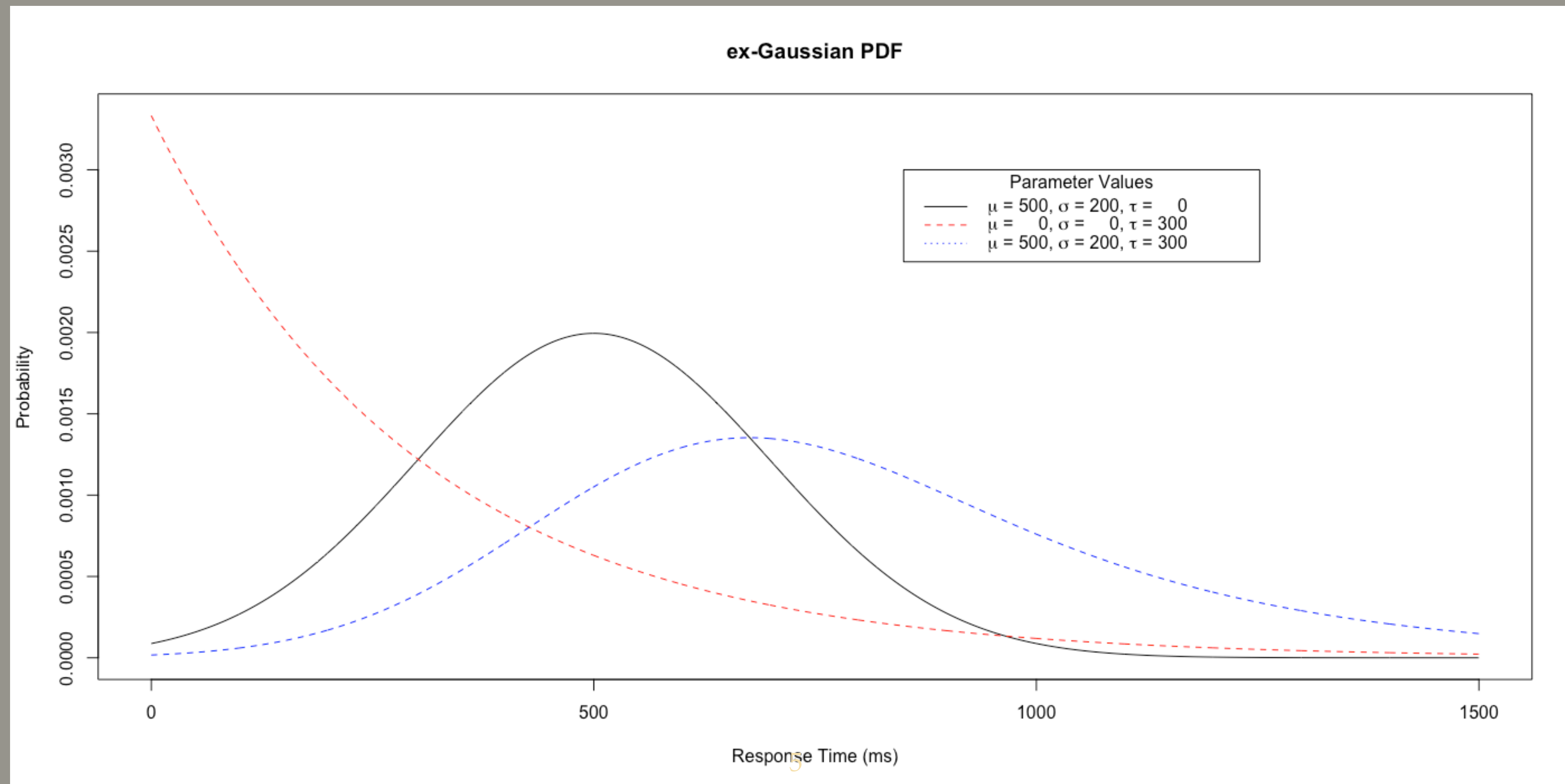
$$f(x|\mu, \sigma, \tau) = \frac{1}{\tau} e^{\left(\frac{\mu}{\tau} + \frac{\sigma^2}{2\tau^2} - \frac{x}{\tau}\right)} \Phi\left(\frac{x - \mu - \frac{\sigma^2}{\tau}}{\sigma}\right)$$





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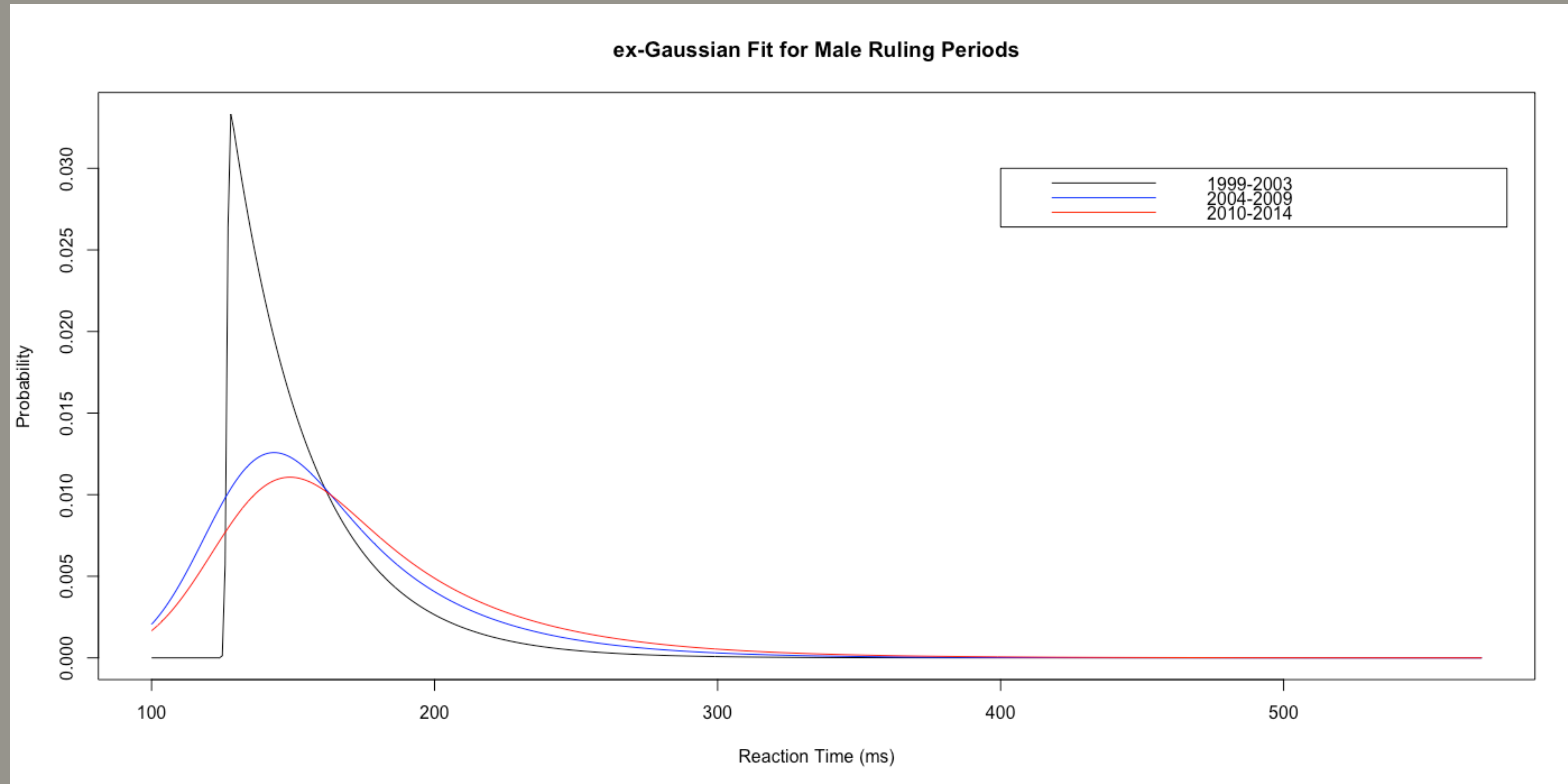


# FITTING TO SPRINTS DATA...

Estimated Parameters of the ex-Gaussian distribution.

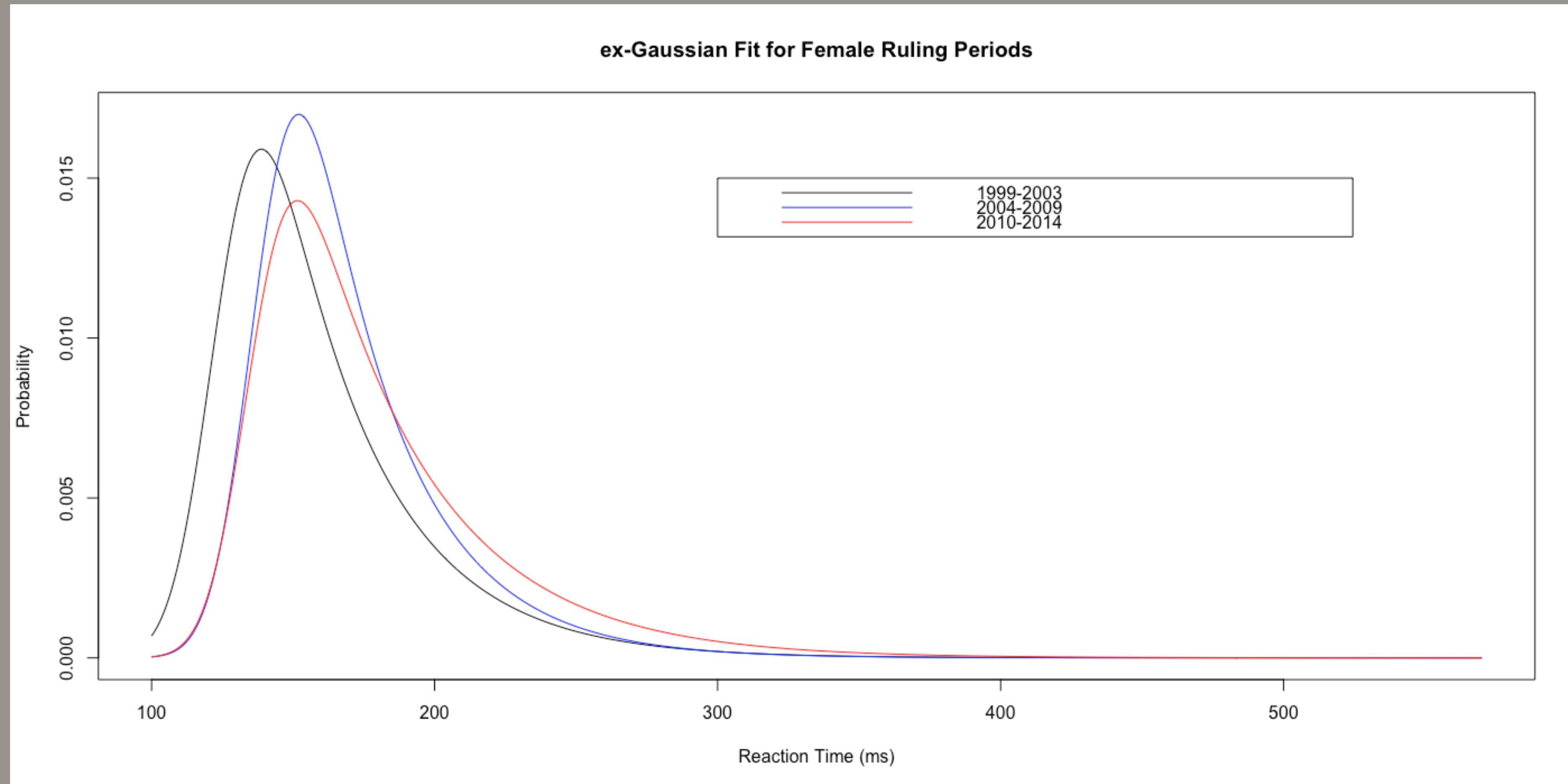
Gender		$\mu$	$\sigma$	$\tau$
Male	1999 – 2003	126.58	0.59	23.31
	2004 – 2009	124.06	18.55	38.47
	2010 – 2014	127.14	20.36	45.20
	Combined	123.95	17.81	39.63
Female	1999 – 2003	124.04	12.50	34.91
	2004 – 2009	138.05	12.25	31.52
	2010 – 2014	135.87	12.13	42.45
	Combined	131.86	8.10	38.06

# FITTING TO SPRINTS DATA...





# FITTING TO SPRINTS DATA...



# RESULTS AND NEXT STEPS...

## Results so far:

- ☒ Data reformatted and validated
- ☒ Initial exploration completed
- ☒ Literature review started
- ☒ Have shown that the reaction times change after a rule change

## Future Work:

- ☐ Difference across distributions
- ☐ Complete literature review
- ☐ Publish a paper
- ☐ Suggest an improved threshold for false start detection

*Thanks for listening!*

*Questions?*

