Dear Prof. Edward Winters & Reviewers,

Manuscript ID RJSP-2016-0387.R1 entitled "The effects of the false start disqualification rules on the reaction times of elite sprinters" has been submitted following a revision based on the feedback from both Editor and Reviewers. Please see below the authors’ response to each of the reviewer’s comments.

The feedback from all parties is greatly appreciated as it has contributed to the significant improvement of this paper.

I look forward to receiving your further comments and feedback.

Sincerely,

Kevin Brosnan

**Prof. Edward M. Winters:**

I note the absence of magnitude-based inferences to evaluate data. As stated in the instructions to authors on our website, these inferences are the Journal's preference.

We agree with the position of the Journal that the use of magnitude-based inferences (effect sizes) should be the preference in all publications with statistical methodology. However, under the modelling structure of the statistics used in this paper it would be inappropriate to use classical effect size measures such as Cohen’s d or Hedge’s g. These are based on the assumption that the populations under consideration are Gaussian and, more importantly, exhibit homogeneity of variances, conditions not satisfied by the populations under consideration here.) What is more appropriate is the comparison of the parameters for each of the proposed models in particular the measure of centrality and variation of each of the distributions. We have also calculated and reported the probability of superiority (*ps*) for each pair of populations being compared (Table 3, Results page 9 line 54, Discussion page 11 line 14 and page 12 line 14). Often used to calibrate magnitude-based effect size measures, *ps* is a notional measure of overlap between two probability distributions and is calculated as the probability that a randomly chosen member from the “upper” population falls above the median of the “lower” distribution. Thus this measure can be used to compare two Exponential Gaussian parents and is appropriate for our purposes.

**Reviewer 1:**

In the submitted manuscript "The effects of the false start disqualification rules on the reaction times of elite sprinters", the authors explore the potential influence of false start rule changes on sprinters' reaction time, in addition to reaction time differences across competition round and gender.

Unfortunately, the authors have performed a very poor literature search. A quick search in PubMed using the term "reaction time in sprinters" reveals that several central studies have been overlooked.

We are grateful to the referee for bringing these journal articles to our attention. We believe that the revised manuscript has benefited by their inclusion.

In fact, all aspects of the research problem in the present study have been explored previously, thus, there is no real novelty associated with this study.

We propose the research has the following novel aspects:

1. The statistical modelling approach utilised for the comparison across ruling periods, sex and competition rounds moves beyond the exploratory analysis tools used in previous studies. This advancement in the statistical methodology utilised provides this study with a novel approach beyond the work of others in this area.
2. Finally, we have also provided revised reaction time thresholds for men and women based on an extensive data set much larger than other studies and the statistical model of this study.

Allow me to list some previously performed studies:

* Haugen et al. 2013. The effect of different starting procedures on sprinters' reaction time. J Sports Sci. 31(7):699-705. This study investigated among others the influence of false start rules on sprinters' reaction time.

This study analyses data across all ruling periods however only focuses on athletes competing in 100 m sprints. We have included all race events up to and including 200 m. The data only includes one championship under the current protocol which could be suffering bias as athletes adjust to the change in rules. Overall this paper is a significant study in this area and has been included in the Introduction page 3, line 50 and the Discussion page 11, line 10.

* Collet 1999. Strategic aspects of reaction time in world-class sprinters. Percept Mot Skills 88: 65–75. This study investigated among others reaction time variations across heat rounds.

This paper has been included in the Introduction page 3, line 41 as it is a valid study in the area. There are some short-comings of this study; most importantly the data precedes even the first rule change which is one of the key aims of our paper; and the assumption of normally distributed reaction times is incorrect as we have shown in our analysis.

* Tønnessen et al. 2013. Reaction time aspects of elite sprinters in athletic world championships. J Strength Cond Res. 27(4):885-92. This study explored among others reaction time across heat round, as well as gender differences.

This paper provides a complete analysis of sprinter’s reaction times and adds significant background to our study. However, this paper examines data for only one false start rule and as such does not provide a comparison across ruling periods, which is a key aim of our study. The paper is discussed in the Introduction page 3, line 43 and in the Discussion page 11, line 12 and page 12, line 2.

* Mero et al. 1992. Biomechanics of sprint running. A review. Sports Med 13: 376-392. Much information also here regarding reaction times in sprinters.

Our paper has not discussed the biomechanics of sprint starts but moreover focuses on the analysis of currently available data, as such we do not think this paper adds significantly to our study.

Lipps et al. (2011) claimed that female sprinters would have similar reaction times to male sprinters if the force threshold used at Beijing was lowered by 22% in order to account for their lesser muscle strength. Even though this is one of very few studies listed in the reference list in the current submission, it is surprising that the authors did not bother to discuss and relate their findings to the Lipps et al. study.

The study of Lipps et al. (2011) is a significant contribution to the literature in the area of reaction times of elite sprinters. As such, in the Discussion page 12, line 52, we have added additional discussion and relation to the findings of this paper and that proposed by Lipps et al. (2011).

Moreover, a major methodological concern is that the authors have not stated what false start systems where used in the varying competitions. The timing and false start systems by either Seiko or Omega have been used in Olympic Games and World Championships for the last twenty-five years. These two incomparable monitoring systems use different technology and false start triggering mechanisms and provide up to 0.04 s difference in reaction time.

Prior to receiving this review the authors had not considered the difference in recording technologies used in World and European Championships. This was a valuable suggestion by the reviewer. Following additional analysis we have found that the reaction times do not differ in the expected value when modelled individually for World and European Championships. As this is a key finding and important in the interpretation of the results it has been included under Methods page 5, line 39, the Results section page 8, line 14 and also in the Discussion page 10, line 23.

See Dapena 2005: The ‘‘loud gun’’ starting system currently used at the Olympic Games does not work properly (<http://www.trackandfieldnews.com/features/2005/startproblem.html>) and Julin & Dapena 2003: Sprinters at the 1996 Atlanta Olympic Games did not hear the starter’s gun through the loudspeakers in the starting blocks. New Studies in Athletics 18, 23–27.

While the issue of “loud gun” v “silent gun” when utilising Olympic Games data and World Championships data is a valid concern, this paper is utilising data from World Championships and European Championships both of which use the “silent gun” system.

**Reviewer 2:**

This manuscript explores the veracity of the criterion to judge false starts in athletics sprint events i.e. the 100 ms interval from the sound of the start gun to force registration on an athlete's starting blocks. The findings indicate that an extension of this 100 ms should occur: to 115 ms for men and 119 ms for women. The arguments for so doing are persuasive.

However, in common with many studies, the term "reaction time" is inaccurate. When a stimulus is delivered, the afferent sensory apparatus has to detect that stimulus, process a motor response, deliver that response as an afferent signal to recruit relevant muscle, convert the electrical signal to a chemical one in the form of acetylcholine to transfer the signal across the synaptic gap, then the chemical signal has to channel through the sarcolemma where the force developing apparatus in muscle is activated. When the required output occurs, the time from administration of the signal to this output is total response time, not reaction time. Response time comprises and can be partitioned into pre-motor (reaction time) and motor time. However, time for force to appear is affected by elasticity of structures. This is why some workers have suggested that completion of a task should be defined as end of movement rather than appearance of force. Some 30 years ago, the area and in particular respective time intervals was the subject of interest under the rubric electro-mechanical delays. Little of this is considered here. This is surprising on two counts: first, it provides a useful underpinning for the study; and second, it allows exploration of sex-based differences, particularly elasticity of tissues.

We agree with the reviewer, the correct term is response time not reaction time. However reaction time and response time has been used interchangeably in the literature and many other published studies on this topic use the term reaction time. For consistency with the literature we have added a definition in the Introduction page 1, line 53.

There are also aspects of expression that could do with a tidy but I leave that for editorial processes to manage. However, my overall impression is favourable and I think that outcomes are useful.

In fact, has(have) the author(s) approached authorities about their findings, or are they waiting until their study has successfully navigated peer review?

It is the authors’ view that successfully navigating the peer review process was important before approaching the relevant authorities with the findings of this study.