



# Effects of Hormonal Contraceptive Use on Baseline Oculomotor Measures for Sport-Related Concussion

Josh Simer, Ryan N. Moran, J. Russel Guin, James Gardner  
Athletic Training Research Laboratory, The University of Alabama



## INTRODUCTION

- Objective measures are vital for concussion testing but may be altered by medical conditions such as learning disorders or migraines<sup>1,2</sup>
- Oculomotor assessments including Near Point of Convergence (NPC) and the King-Devick Test (KD) have been proven to be imperative in concussion diagnosis accuracy and return to play protocol.<sup>3,4</sup>
- There are differences in female and male performance on concussion tests and it is hypothesized the hormones may contribute to that difference.<sup>5,6</sup>
- It has been noted that females using hormonal contraception (HC) demonstrate lower Sport Related Concussion (SRC) symptom severity and frequency compared to non-HC users.<sup>7</sup>
- Limited literature exists examining the role of female sex hormones, HC use, and oculomotor function as it related to concussion assessment.

## PURPOSE

To examine the effects of HC use on NPC and vision-based number naming testing (KD) in a sample of recreationally active, healthy college individuals.

## METHODS

**Participants:** 63 participants (22 HC using females, 22 non-HC using females, 19 males)

**Procedures:** Participants completed a baseline SRC battery including the NPC and KD tests.

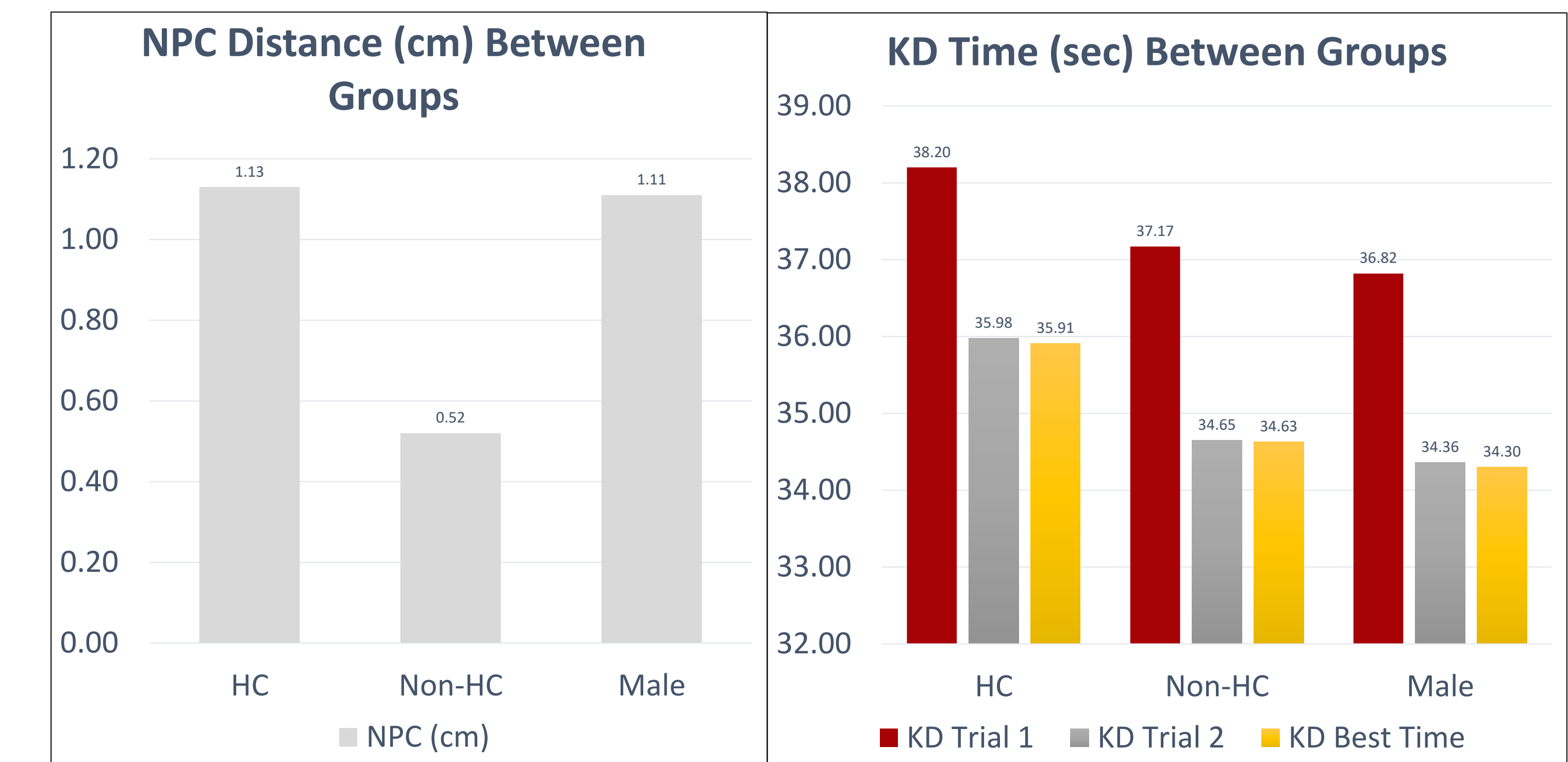
**Measures:** NPC was measured as the mean convergence distance (cm) of three trials. KD test time (sec) was recorded as the total time for each of the two trials, with the better being marked as their baseline time. Shapiro-Wilk tests showed that KD data presented normally while NPC did not. One way ANOVA was conducted to compare HC, non-HC, and male KD times and Kruskal-Wallis H Test was used to compare NPC distances.

Hormonal Contraception use does not alter performance on Near Point of Convergence or King-Devick tests

Clinicians need to consider factors that may influence SRC testing performance

More research is needed to understand how sex hormones effect SRC testing

## RESULTS



**No significant difference** was found in NPC distance between groups ( $p=0.41$ ) and in KD time by trial (Trial 1  $p=0.65$ , 2  $p=0.48$ ) and best time ( $p=0.49$ ).

## DISCUSSION

- HC use does not appear to influence the oculomotor measures that are taken into consideration when diagnosing concussion or obtaining baseline information.
- Clinicians should be cognizant of the effects of modifying factors on concussion tests, both at baseline and post-concussion.
- Additional research may be needed to better understand various sex hormone level impacts on SRC measures.

## REFERENCES

- Elbin, R. J., Kontos, A. P., Kegel, N., Johnson, E., Burkhart, S., & Schatz, P. Individual and combined effects of LD and ADHD on computerized neurocognitive concussion test performance: evidence for separate norms. *Arch Clin Neuropsychol.* 2013;28(5):476-484. doi:10.1093/arclin/act024
- Zuckerman, S. L., Lee, Y. M., Odom, M. J., Solomon, G. S., & Sills, A. K. Baseline neurocognitive scores in athletes with attention deficit-spectrum disorders and/or learning disability. *J Neurosurg Pediatr.* 2013;12(2):103-109. doi:10.3171/2013.5.PEDS12524
- Mucha, A., Collins, M. W., Elbin, R. J., et al. A brief Vestibular/Ocular Motor Screening (VOMS) assessment to evaluate concussions: preliminary findings. *Am J Sports Med.* 2014;42(10):2479-2486. doi:10.1177/0363546514543775
- Galetta, K. M., Liu, M., Leong, D. F., et al. The King-Devick test of rapid number naming for concussion detection: meta-analysis and systematic review of the literature. *Concussion.* 2016;1(2):CNC8. doi:10.2217/cnc.15.8
- Wunderle, K., Hoeger, K. M., Wasserman, E., Bazarian, J. J. Menstrual phase as predictor of outcome after mild traumatic brain injury in women. *J Head Trauma Rehabil.* 2014;29(5):E1-8. doi:10.1097/HTR.0000000000000006
- Covassin, T., Swanik, C. B., Sachs, M., et al. Sex differences in baseline neuropsychological function and concussion symptoms of collegiate athletes. *Br J Sports Med.* 2006;40(11):923-927; discussion 927. doi:10.1136/bjsm.2006.029496
- Gallagher, V., Kramer, N., Abbott, K., et al. The Effects of Sex Differences and Hormonal Contraception on Outcomes after Collegiate Sports-Related Concussion. *J Neurotrauma.* 2018;35(11):1242-1247. doi:10.1089/neu.2017.5453

