

Selective and Sustained Attention among Fencing Athletes

¹Aida Al-Awamleh, ²Aws Khaled Aljbour, ³Ahmad Hamdan, ⁴Hasan Al khaldi, ¹The University of Jordan School of Sport Sciences, ²The Hashemite Kingdom of Jordan Ministry of Education, ³ Bana Center For Consultation, Research & Training, ⁴The Hashemite University Faculty of Physical Education and Sport Science, Email: Aida.awamleh@ju.edu.jo

Attention is awareness of the here and now in a focal and perceptive way; it is the interface between the vast amount of stimulation provided by our complex environment and the more limited set of information of which we are aware. Attention especially affects athletes; it is important in fencing, and effects the levels of performance and achievement in fencers. The aim of the present study was to determine the attention types (selective & sustained) and processing speed and to find the gender differences of fencing athletes regarding attention types. The study sample consisted of 20 subjects who were selected from the Jordan Fencing Federation. The Leiter International Performance Scale (Leiter-3) was used to evaluate the two attention types and processing speed. The results indicated that fencing athletes show greater ability in attention types; sustained attention and selective attention (Stroop effect) were high. The fencing athletes recorded higher scores on the Stroop colour congruent than the Stroop colour incongruent. Some differences were found regarding gender differences, females having significantly higher scores in the most of attention types than males, females having significantly higher Stroop colour congruent stimuli and Stroop colour incongruent stimuli results than males.

Key words: *fencing athletes, attention, gender, selective attention, sustained attention, processing speed. Stroop colour*

1. Introduction

Elite sports performance fundamentally relies on a complex set cognition. Successful performance in fencing is contingent upon key cognitive skills such as attention, Attention is considered to be one of the important psychological factors that determine superiority in fencing; it is a part of cognition. Attention is of great significance for fencers. Fencing is an open-skilled Olympic and Para-Olympic combat sport; the performance of a fencer highly

depends on the quickness of his movements regarding the opponent's action. It is a fighting sport aimed at hitting an opponent while avoiding being hit. The fencer needs to analyse and select visual information provided by his opponent before the beginning of his motion so attentional processing is not isolated from other cognitive processes, and can be influenced by perceptual, language, memory, and response mechanisms. Attention is one of the most important mental processes for the growth of an individual's knowledge; it is a basic but complex cognitive process that has multiple subprocesses specialised for different aspects of attentional processing, such as memory and cognitive processes (Riddle, 2007). It is one of the most popular contrasts in modern cognitive psychology, playing a critical role in the scientific analysis of various forms of information processing and behaviour. There are several types of attention, notably selective, divided, and sustained attention. Selective attention refers to the ability to attend to some stimuli while disregarding others that are irrelevant to the task at hand. It also refers to the differential processing of simultaneous sources of information. For example, in a Stroop task, participants were asked to name the color of ink in which an incongruent colour word was printed to measure the effects of interference on attention. Meanwhile, a divided attention task requires the processing of two or more information sources or the performance of two or more tasks at the same time, meaning participants may have to monitor stimuli at two different spatial locations (Riddle, 2007; Becker et al 2018). Lastly, sustained attention is the ability to maintain concentration on a task, activity, or stimulus over an extended period of time. It is also a fundamental component of attention characterised by the readiness to detect rarely and unpredictably occurring signals over prolonged periods of time (Drag & Bieliauskas, 2009; Beens & Udo, 2000)

Visual sense plays an important role in physical activity. And it provides athletes with an estimated 80% of the sensory input that occurs during physical activity (Ariel, 2012).

A study by Gu, Zou, Loprinzi, Quan, and Huang (2019) found that skills performed in a variable and unpredictable environment are classified as open skills, such as fencing, where it is difficult to predict an opponent's movement. With fencing, the critical factor is timing, as this determines the preparation for and execution of modified movement, given open skills involve the rapid relocation of the learners' attention to different aspects of the environment (Hassan, Dowling, & McConkey, 2014). Researchers found that open skills lead to greater improvements in cognitive function in both children and older adults (Cumming, Clark, Ste-Marie, McCullagh & Hall, 2005; Gu, et al., 2019; Law & Hall, 2009). The published literature showed that few studies, however, have compared attention types of fencing regarding genders. The researchers assumed there would be significant differences in attention types regarding gender. Furthermore, the researchers predicted that elite athletes would record higher attention scores in fencing as an open sport.

1.1 Study Objectives

This study had two primary objectives:

- 1- To determine the differences between attention type among fencing athletes.
- 2- To determine the gender differences of fencing athletes regarding attention types.

2. Methods

The study sample consisted of 20 subjects who were selected; 20 fencers (13 males and 7 females) who were selected from the Jordan Fencing Federation. Table (1) shows the demographic characteristics of the total sample. The Leiter International Performance Scale (Leiter-3) was used to evaluate attention types. The Leiter-3 is used to evaluate nonverbal cognitive, attentional, and neuropsychological abilities in typical and atypical children, adolescents, and adults. In this study, the researcher used SUBTEST 6: Attention Sustained, a subtest from Leiter-3 parts 5, 6, 7, and 8 that requires participants to select a target shape or pattern (e.g., ) within a complex array of different shapes and in a specified time of 30 or 60 seconds. Furthermore, SUBTEST 10 was used to assess selective attention by requiring the participants to select a Stroop colour congruent  or colour  incongruent target within 45 seconds.

Table 1. Demographic characteristics of the total sample (n = 20)

	Categories	<i>fencing athletes</i> n = 20
		n
Gender	Male	13
	Female	7
	Total	20
Age	7–11 years	1
	> 11–16	19
	Total	20

Data Analysis

The data analyses were performed using the SPSS 21.0 software system. After compiling the subjects' descriptive statistics, T test was used to find the gender regarding attention types

3. Results

The description of athletes scores are summarised in Table (2). The mean sustained attention score was 158.30 (SD = 23.40), whereas the mean for selective attention (Stroop effect) was 24.05 (SD = 6.49). For Stroop colour congruent stimuli, the mean score was 37.85 (SD = 8.84) and for colour incongruent stimuli, it was 13.80 (SD = 5.64). The processing speed scores mean of was 103.15 (SD = 17.35).

Table 2. Descriptive statistics for fencing athletes, according to attention type

Attention types	n = 20	
	M	SD
Sustained attention	158.30	23.40
Stroop colour congruent	37.85	8.84
Stroop colour incongruent	13.80	5.64
Selective attention (Stroop effect)	24.05	6.49
processing speed	103.15	17.35

Table 3. Gender Differences in Selective and Sustained Attention among fencing Athletes

Attention types	gender	N	M	SD	T	p
attention sustained	males	13	146.85	16.58	3.98	0.001
	females	7	179.57	19.30		
processing speed	males	13	94.77	12.19	3.88	0.001
	females	7	118.71	14.90		
color congruent	males	13	33.31	5.88	4.38	0.000
	females	7	46.29	7.11		
color incongruent	males	13	11.54	4.58	2.87	0.10
	females	7	18.00	5.23		
stroop - effect	males	13	21.77	4.88	2.39	0.028
	females	7	28.29	7.32		

A T- test was used to assess sustained attention and selective attention (Stroop effect) regarding gender. The results indicated that females have significantly higher attention sustained (M = 179.57, SD = 19.30 Stroop colour congruent stimuli (M = 46.29 , SD = 7.1), and for stroop - effect stimuli (M = 28.29 , SD = 7.32) than males as can be seen in table (3). Hence, there was a significant difference between males and females in terms of attention; on the other hand males were faster in the processing speed (M =94.77 , SD = 12.19) than females.

4. Discussion

Attention is important in fencing as it affects the levels of performance and achievement in fencers. The aim of the current research was to investigate different types of attention (selective and sustained), and to determine gender differences on attention types. The results indicated

that sustained attention and selective attention (Stroop effect) were high. Overall, the athletes recorded higher scores on Stroop colour congruent than Stroop colour incongruent. Generally, sports such as fencing required faster performance. A study by Borysiuk and Waskiewicz (2008) indicated that fencing requires a high perceptual and attentional capacity for fencers to be able to develop deceptive strategies that facilitate anticipation during attack, while preparing a reaction to a potential defensive response; the practice of the fencing sport is applicable to act beneficially on the development of cognitive, attention and processing speed. The current study found a significant difference between males and females in terms of attention sustained, females having a significantly higher score than males overall; figure 1 demonstrates gender differences in attention types. Gender differences in cognition have been a source of curiosity and conflict for decades. Most known gender differences have small effect sizes (Borysiuk & Waskiewicz, 2008; Hyde, 2014). A study posted by Chan (2001) shows that there is no effect of gender on sustained attention. Furthermore, in this study we observed a significant difference between males and females on the Stroop colour congruent stimuli and the Stroop effect stimuli such that differences were in favour of females. Selective attention (Stroop-task) is one of the most popular studies to check the ability of decision-making and cognitive process during high interference activity in the brain. Selective attention (Stroop) is considered a central component of cognitive functioning. While a number of studies have demonstrated gender differences in cognitive tasks, there has been little research conducted on gender differences in selective attention.

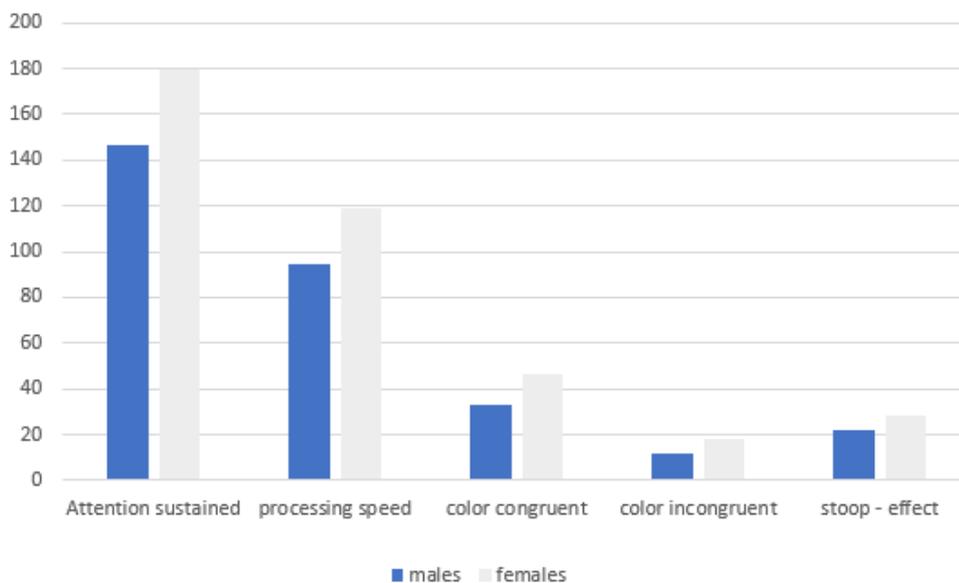


Figure 1 . Gender Differences in Selective and Sustained Attention among fencing Athletes

In fencing, each individual's ability level depends on many variables attentions and visual perception are the most important, including the accuracy.



The current study found a significant difference between males and females in terms of selective attention, with females having significantly higher Stroop color congruent stimuli and Stroop colour incongruent stimuli have higher results than males. A study by Lee, Chung, Chang, Kim, Kim, Park, and Jeong (2012) found that males performed generally faster in selective attention. Other studies using Stroop effect tasks reported that women showed less interference than men in these tasks (Van der Elst, Van Boxtel, Van Breukelen. J., & Jolles, 2006). In contrast, the researchers Christakou, Halari, Smith, Ifkovits, Brammer and Rubia (2009) did not observe gender differences in selective attention.

5. Conclusion

In summary, attention and visual perception are important in fencing, as they affect the levels of performance and achievement in fencers. It is a complex cognitive process that demands the orderly structuring of several brain areas aimed at understanding and maintaining this processing for a certain period. The current study's results have provided evidence of the positive impact of exercise on attention, as the athlete participants with open skills such as fencing showed greater scores in different attention types (selective and sustained). The fencing athlete participants yielded greater scores in selective attention (Stroop effect) with favour to females.

A deep understanding about the effects of motor skills training in terms of outcomes and based on the current literature shows that movement skills are influenced by individuals, tasks, and environmental factors. The great contribution of sport such as fencing to the development of executive and attentional capacity is due to the brain organisation for the accomplishment, learning and control of the motor task (Christakou et al 2009; Al-Awamleh,2020; Fernandes, Arida, & Gomez-Pinilla 2017). Understanding different types of skills and attention helps analyse and improve athletes' cognition and performance level. Coaches, athletes, and practitioners could prescribe general attention type principles with regard to motor skill training approaches to help athletes achieve peak performance. Lastly, future research should concentrate further to measure different aspects of cognition using larger sample sizes and different sports, such as soccer, karate, football, basketball, and baseball, or in closed skills, such as in swimming and golf.



REFERENCES

- Al-Awamleh, A. (2020). The Effects of Open and Closed Skills on Athletes' Attention Types; doi:10.30845/aijcr.v10n2p4.
- Ariel, B. (2012.). Sports vision training: An expert guide to improving performance by training the eyes.
- Becker, D. R., McClelland, M. M., Geldhof, G. J., Gunter, K. B., & MacDonald, M.(2018). Open-skilled sport, sport intensity, executive function, and academic achievement in grade school children. *Early Education and Development*; 29(7), 939-955.
- Beens, J., & Udo, A. The role of gas chromatography in compositional analyses in the petroleum industry. *TrAC Trends in Analytical Chemistry*;2000. 19(4), 260-275. doi:10.1016/S0165 0173(01)00044-3.
- Borysiuk, Z., & Waskiewicz, Z.(2008). Information processes, stimulation and perceptual training in fencing. *Journal of Human Kinetics*;,19, 63-82.doi:10.2478/v10078-008-0005y.
- Chan, R. C. A. (2001) further study on the sustained attention response to task (SART): the effect of age, gender and education. *Brain Injury*;. 15(9), 819-829.DOI: 10.1080/02699050110034325
- Christakou, A., Halari, R., Smith, A. B., Ifkovits, E., Brammer, M., & Rubia, K. (2009).Sex-dependent age modulation of frontostriatal and temporo-parietal activation during cognitive control. *Neuroimage*; 2009. 48(1), 223-236.. DOI: 10.1016/j.neuroimage.06.070
- Cumming, J., Clark, S. E., Ste-Marie, D. M., McCullagh, P., & Hall, C. (2005).The functions of observational learning questionnaire (FOLQ). *Psychology of sport and exercise*; 6(5), 517-537.DOI: 10.1016/j.psychsport.2004.03.006
- Drag, L. L., & Bieliauskas, (2010).L. A. Contemporary review 2009: cognitive aging. *Journal of geriatric psychiatry and neurology*; 23(2), 75-93.
- Fernandes, J., Arida, R. M., & Gomez-Pinilla, F. (2017). Physical exercise as an epigenetic modulator of brain plasticity and cognition. *Neuroscience & Biobehavioral Reviews*; 2017. 80, 443-456. doi:10.1016/j.neubiorev.06.012. doi: 10.1016/j.neubiorev.2017.06.012.
- Gu, Q., Zou, L., Loprinzi, P. D., Quan, M., & Huang, T.(2019). Effects of open versus closed skill exercise on cognitive function: A systematic review. *Frontiers in psychology*; 10, 1707.https://doi.org/10.3389/fpsyg.2019.01707.
- Hassan, D., Dowling, S., & McConkey, R. (Eds.).(2014). *Sport, coaching and intellectual disability*. Routledge. https://doi.org/10.4324/9781315818726.
- Hyde, J. S. (2014). Gender differences and similarities. *Annual Review of Psychology*;. 65, 373-398.. DOI: 10.1146/annurev-psych-010213-115057
- Law, B., & Hall, C. (2009). The relationships among skill level, age, and golfers' observational learning use. *The Sport Psychologist*; 23(1), 42-58. https://doi.org/10.1123/tsp.23.1.42.



- Lee, J., Chung, D., Chang, S., Kim, S., Kim, S. W., Park, H., & Jeong, J.(2012.). Gender differences revealed in the right posterior temporal areas during Navon letter identification tasks. *Brain imaging and behavior*; 6(3), 387-396.. DOI: 10.1007/s11682-012-9153-8.
- Riddle, D. R. (Ed.) (2007). *Brain aging: models, methods, and mechanisms*. CRC Press.
- Van der Elst, W., Van Boxtel, M. P., Van Breukelen, G. J., & Jolles, J. (2006).The Stroop color-word test: influence of age, sex, and education; and normative data for a large sample across the adult age range. *Assessment*;. 13(1), 62-79. DOI: 10.1177/1073191105283427.