

Handedness differences in eye-hand coordination and, Choices, simple reaction time of international handball players

AIDA A. AL AWAMLEH¹; TAIYSIR MANSI²; HASAN ALKHALDI³

^{1,2} Department of Instruction and Supervision, Faculty of Physical Education, The University of Jordan

³ Department of Coaching and Sport Management, Faculty of Physical Education and Sport Science, The Hashemite University

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Abstract

The purpose of this study was to observe handedness differences between Jordanian women's international handball team in cognitive task performance (eye-hand coordination, Choices, simple reaction time and movement times). Twelve females nine right-handed (based on hand used for writing) and 3 left handed, aged 17 to 25 years (M = 21,3 yr, SD = 2,7) participated in this study. Measurements for reaction time were taken using the Reaction Time Apparatus Lafayette Instrument Multi-Operational Apparatus for Reaction Time Model 35600 and eye-hand coordination by Steadiness Tester, Hole Type Model 32011. The result indicated that there were significant differences found between right-handed and left-handed in terms of simple Auditory Reaction time high tone, and visual choice reaction time movement time.

Key words: eye-hand coordination, Reaction Time, Auditory Stimuli, Visual Stimuli, Handedness

Introduction

About 90 percent of all humans are right-handed, the left- brain dominates for motor skills because the vast majority of people are right –handed, Coon & Mitterer (2011; 2008). Right hands often show performance differences that have been attributed to hemispheric specialization. The right hemisphere is superior at imagery and visual abilities, therefore lefties are better at visualization In general, left –handers are more symmetrical on almost everything including eye dominance, fingerprints, Coon & Mitterer (2011; 2009). A number of studies have investigated handedness differences Kosinski (2008) suggested that left-handed players have probably an intrinsic neurological advantage. Researchers recently reported that the left-handed athletes had a shorter mean RT than right-handed athletes (Eckner et al., 2010).

Dane and Erzurumluoglu (2003) reported that left-handed people have an advantage when playing sport, left-handers had superiority over the right-handers using visual reaction times test. Study conducted by Fisekcioğlu (2011) demonstrated that left -handed taekwondo players perform better than right –handed in terms of simple Auditory Reaction time.

Holtzen (2000) Found that left handed have neuroanatomically-based advantages in performing certain neurocognitive tasks such as gross visuomotor tasks ,Loffing et al. (2010) reported Left-handers were found with disproportionately more frequency in interactive sports such as tennis ,fencing. Left-handers' performance advantage persists in amateur tennis (Loffing et al., 2012). However, there is a lack of research in Handedness differences in eye-hand coordination and reaction time in handball.

The purpose of this study was to investigate handedness differences between Jordanian women's international handball team in visual and auditory reaction times, Simple, Choices reaction time and movement times and eye-hand coordination.

Methodology

Participants

Participants were 12 females (M = 21, 3 yr, SD = 2, 74) who are professional handball player's athletes; they completed visual, auditory simple and choice reaction time and eye-hand coordination tests. Nine right-handed (based on hand used for writing) and 3 left handed, Table 1 presents the sample description.

Procedures

All participants had normal or corrected-to-normal vision and hearing, And all the tasks were administered individually in a psychology laboratory. After an initial session in which participants were informed about the objectives of the study. All the data were systematically coded and subjected to SPSS package

Measures

The participants were required to take the following tasks (tests).

Simple reaction time press to respond

A single stimulus is presented. The player responds to the stimulus as quickly as possible with no conditions or choices

Simple reaction time press to respond & move

The player rests their finger on the C0 key. After a stimulus is presented, the player lifts their finger off of the C0 key and taps the C5 key as quickly as possible.

Choice reaction time L1 R1 L4 R4 press to respond

The player has fingers over multiple keys. A stimulus light turns on over one of the keys. The player responds by pressing or releasing the corresponding key as quickly as possible

Choice reaction time L1 R1 L4 R4 press to respond & move

The player starts on single key (C0). A stimulus is presented over one of L1 R1 L4 R4 lights. The player releases the C0 key and moves to the key corresponding to the light as quickly as possible.

Simple reaction time high tone Cue delay 02.5s Trial time out 05.0

A single stimulus is presented. The player responds to the stimulus as quickly as possible with no conditions or choices

Measurements for reaction time were taken using the Reaction Time Lafayette Instrument Multi-Operational Apparatus Model 35600 Figure 1.



Figure 1. Multi-Operational Apparatus for Reaction Time (MOΨART)

Hand-eye coordination manual dexterity 10 s Measure by Steadiness Tester, Hole Type Model 32011 Figure2.



Fig. 2. Steadiness Tester, Hole Type, Model 32011

The player's task is to hold a metal-tipped stylus in 9 progressively smaller hole sizes (1.156; 1.125; 0.5; 0.312; 0.187; 0.109; 0.093; 0.078; 0.0625) inches without touching the sides. Silent Impulse Counter Model 58024C used to detect errors.

Results

A nonparametric Mann-Whitney U-test was used to test handedness differences. The results indicated that no statistically significant differences were found in Simple Visual Reaction Time and simple movement time and visual choice reaction time (without movement).

The result indicated that there were significant differences found between right-handed and left-handed in terms of simple Auditory Reaction time high tone, the left handed tended to be somewhat shorter than those of the right hand (203,6 ms . 239,08 ms, respectively, $z = -2,126$; $p = 0,033$), figure

Table 1. Handedness differences in simple Auditory Reaction time high tone

simple Auditory Reaction time	Mean		Mann-Whitney U	
	Right	Left	Z	Asymp .Sig
	239.0	203.6	-2,126	0,033

There was also a significant differences found on visual choice reaction time L1; R1;L4;R4 press to respond & Movement time ($z = -2,126$; $p = 0,033$).

The result also indicated that there were no significant differences found between right-handed and left-handed in terms of eye-hand coordination as seen in table 2 .

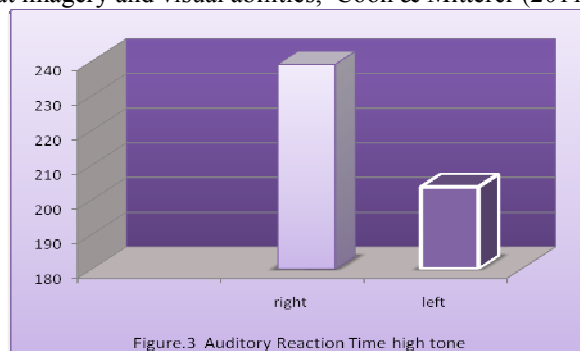
Table 2. Handedness differences in eye-hand coordination manual dexterity of international handball players

Items	Mean		Mann-Whitney U	
	Right	Left	z	Asymp .Sig
hand-eye coordination manual dexterity 10 s				
1.156 inches	58.50	19.50	.000	1.000
1.125 inches	55.00	23.00	-.995	.320
0.5 inches	64.50	13.50	-1.323	.186
0.312 inches	58.50	19.50	.000	1.000
0.187 inches	55.00	23.00	-.654	.513
0.109 inches	49.00	29.00	-1.760	.078
0.093 inches	52.00	26.00	-1.212	.225
0.078 inches	49.50	28.50	-1.667	.096
0.0625 inches	53.00	25.00	-1.021	.307

Discussion

The purpose of this study was to determine if handedness differences exist on athletes (Jordanian women's international handball team) in cognitive task performance (eye-hand coordination, Auditory and Visual Simple and Choice Reaction Times, and movement times). The present findings demonstrate that the handedness differences in Visual simple reaction time and eye-hand coordination does not exist, these findings are inconsistent with previous research such as Dane and Erzurumluoglu (2003) and (Holtzen,2000) their results indicated that left hander's perform better than right hander's in visual reaction times, and gross visuomotor tasks . Furthermore, study cited by Löffing et al., (2012) found that a left-handers' performance advantage persists in amateur tennis and Eckner et al., (2010) reported that the left-handed athletes had a shorter mean RT than right-handed athletes. We found handedness differences in simple Auditory Reaction time high tone, the left-handed players tended to be somewhat shorter than those of the right -hand players as seen in figure 3.

These findings are supported by Fisekcioglu (2011) who found that left -handed taekwondo players perform better than right -handed in terms of simple Auditory Reaction time. Our results have shown handedness differences in term of visual choice reaction time L1; R1; L4; R4 press to respond & Movement time. Left hander's tend to be better than right hander's players, The explanation for that is, in general, the Functions of the brain the right hemisphere are more specialized for the analysis of space and geometrical shapes and forms and it is superior at imagery and visual abilities, Coon & Mitterer (2011; 2009).



Conclusion

The current study focuses on handedness differences in eye-hand coordination and reaction time. We investigated only female handball players, this designed only for Jordanian women's international handball team. The researchers suggest that differences in the handedness of athletes needs to be further investigated and we recommended that effects of handedness differences must be taken into account when designing experiments into human cognition and athletic training.

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