

P1-The roundhouse kicks to the chest and to the head in a sample of male and female taekwondo athletes

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In taekwondo, kicks to the head worth more points than kicks to the chest. Strategically it seems reasonable to kick towards the head to score most possible points. The aim of the present study is to examine mechanical variables in the roundhouse kick to the head and to the chest in a sample of 31 male and 14 female taekwondo athletes using three execution distances. Females kick with similar impact force and time in both kicks. From distances they do not usually train, male kick to the head with longer total response time than to the chest. Female taekwondo athletes should kick to the head more frequently because it offers more options to score points, and male should kick to the head more frequently when they develop it from distances they usually train.

**Keywords:** chest, head, kick, mechanics, height, distance

## INTRODUCTION

The aim of taekwondo athletes is to knock out or score more points than the opponent. Nowadays, based on competition rules a kick to the head is worth three points while a kick to the chest is worth one point (WTF, 2010). From a tactical point of view it seems more efficient to kick towards the head to score more points with just one kick. Taken into account all the alternatives, there are two kinds of kicks more frequently used: the roundhouse kick to the chest and to the head. Both can be easily adjusted to the execution distance (Falco et al. 2009) while the main difference between them is the height of the target (O'Sullivan et al. 2009). Estevan et al. (2009) and Falco et al. (2009) stated that performance analysis must be done in different groups according to the gender and to the execution distance (ED), respectively, because ED affects the kick performance and male have higher performance than female. Understanding these interactions may contribute to identify components coaches can address in order to increase competitiveness in taekwondo players. To that end, this study aims to examine mechanical variables in the roundhouse kick to the head and to the chest in a sample of male and female taekwondo players using three execution distances (short, medium and long).

## METHODS

Forty-nine taekwondo players (31 male and 14 female) weighing from 46 to 101 kg ( $M = 70.97$ ;  $SD = 12.91$ ) and with a height ranging from 1.53 to 1.93 m ( $M = 1.73$ ;  $SD = 0.15$ ) were selected to participate in the study. ED was established according to their leg length (Falco et al., 2009). The data collection was made using a force platform, a contact platform, a led or red light, a microcontroller and a Pc. The Bonferroni correction was applied to reduce the accumulated error in the 12  $t$ -tests performed ( $p < .01$ ).

## RESULTS

As can be seen in table 1,  $t$ -test for related samples showed no differences in female group. However, male kick to the head with longer total response time than to the chest ( $p > .01$ ).

## DISCUSSION

The results of the present study showed no differences in impact force, reaction time and execution time between roundhouse to the chest and to the head. This is in contrast with Hong et al. (2000) who found higher execution time in the kicks directed at a greater height, and also in contrast with O'Sullivan et al. (2009) and Estevan et al. (2009). In this last study, lower level athletes group, kick with higher impact force in kicks to the chest than to the head. Nonetheless, they did not study the kick with reaction time, that is, athletes kicked freely.

Future studies should compare the kick performance between both conditions: free kicking and reacting to a signal.

Our results shows that female have similar performance in both kicks, that is, the kind of roundhouse kick does not condition effectiveness of execution (with similar force and similar time). Thus, female taekwondo athletes should kick to the head more frequently because it offers more options to score points. However, male kick to head in longer total response time than kicks to the chest when they kick from distances they do not usually train (distances different to ED2) (Estevan et al. 2009). One possible reason for these results could be the different ability of male and female to generate greater lower limb acceleration in kicks to the head level with regard the kinetic link principle. Thus, it seems that the mechanism of the kick is different in male than female, so future studies should take into account not only taekwondo athletes' level but also gender. Therefore, more studies are also needed with regard the most similar situation to competition.

Table 1. Comparative analysis of the mechanical variables in male and female groups.

	ED	Male (n = 31)				p	Female (n = 14)				p
		RK chest		RK head			RK chest		RK head		
		M	SD	M	SD		M	SD	M	SD	
IF	1	1502,34	720,28	1229,6	453,52	.04	849,29	253,38	877,89	301,14	.80
	2	1199,34	691,36	1174,21	513,86	.85	715,64	196,65	831,79	249,13	.33
	3	1127,81	555,11	993,06	473,71	.23	679,43	244,16	757,79	255,62	.36
RT	1	0,484	0,086	0,525	0,098	.06	0,529	0,077	0,504	0,1	.47
	2	0,528	0,121	0,551	0,096	.33	0,514	0,09	0,557	0,098	.26
	3	0,609	0,109	0,639	0,119	.18	0,613	0,146	0,617	0,09	.92
ET	1	0,262	0,069	0,295	0,073	.04	0,280	0,049	0,302	0,052	.36
	2	0,288	0,067	0,312	0,058	.15	0,349	0,128	0,318	0,056	.36
	3	0,344	0,094	0,386	0,113	.08	0,373	0,117	0,349	0,032	.46
TT	1	0,743	0,078	0,816	0,094	.01*	0,798	0,08	0,807	0,113	.82
	2	0,813	0,117	0,863	0,093	.07	0,864	0,128	0,871	0,085	.88
	3	0,949	0,096	1,026	0,11	.01*	0,981	0,072	0,980	0,083	.98

Note: RK chest: roundhouse kick to the chest; RK head: roundhouse kick to the head; IF: impact force in Newtons (N); RT: reaction time in seconds (s); ET: execution time in seconds (s); TT: total response time in seconds (s).

## CONCLUSION

In conclusion, female taekwondo players should develop roundhouse kick to the head more frequently because it offers more options to score points and the kick efficiency is not influenced by the kind of roundhouse kick. Regarding male, they also should kick to the head more frequently when they develop it from distances they usually train.

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