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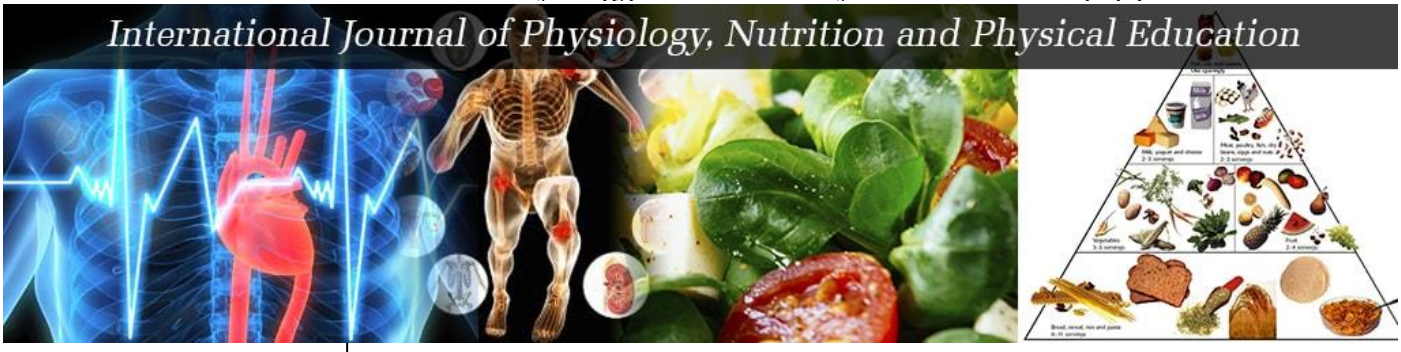

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Effect of warming up on physical fitness of players (Hockey)

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Abstract
Introduction: The purpose of study was to determine the effect of warming up of different durations on selected physical fitness components of hockey players.
Methodology: 20 male hockey players who participated in intra college tournament and were short listed for inter university coaching camp were selected for this study. The tests items applied in the study were vertical jump, sit & reach, standing Broad Jump (SBJ) and shuttle run. The tests were administered consecutively for 4 days. On first day test was conducted without warm up, on 2nd day after 5 minutes warming up, on 3rd day after 10 minutes warming and on 4th day15 minutes warming up respectively.
Result: The data obtained were examined by one way analysis of variance (anova) and it was found that there was a significant difference in different durations of test administrations. In the Legs power test the subjects have shown better performance after 15 min. warm-up followed by 10 min. warm-up, after 5 min. warm-up, and least performance was shown by the subjects when they performed after no warm-up. Similarly in case of Trunk flexibility test the subjects have shown their better performance after 15 min. warm-up followed by 10 min. warm-up, 5 min. warm-up and shown least performance without warm-up. In case of Agility test the subjects have shown their better performance after 15 min. warm-up followed by 10 min. warm-up, 5 min. warm-up and shown least performance without warm-up.
Conclusion: it was found that the performance increased continuously after each test administered.

Keywords: Physical fitness, hockey players, anova

Introduction
The term warm-up in Physical education and sports is defined as a period of preparatory exercise to raise the body temperature or training performance. Traditional warm-up includes a brief period of low-intensity aerobic exercise followed by stretching and sports specific exercise. The general purpose of a pre exercise warm-up is to increase muscle and tendon suppleness, to stimulate blood flow to the periphery, to increase muscle temperature, and to enhance free, coordinated movement. Given the amount of focus and importance that professional athletes place on warm-up, there is a surprisingly limited amount of ‘‘good’’ research evaluating whether a warm-up improves performance. Human body can be compared with a car engine in respect to warm up. It is well known that car engine functions at a temperature above that of normal garage conductions and that temperature is attained by letting the engine run for a few minutes before driving, that is by allowing it to warm up. Similarly an athlete often feels that he can perform better after warming-up his body.
A major discussion concerns the use of various types of warming-up procedure before engaging in physical activity i.e the physical educator and coach must be familiar with the available evidence before determining whether or not to use the warm-up or how to use it most effectively. Warming-up procedures are usually based on the trial and error experience of the athlete or coach, rather than on scientific study. Although the practice of some of the recommended warm-up components is widely undertaken, the value of warm-up has become a worthy research issue as it is not known whether warming-up is of benefit, of potential harm, or having no effect on an individual’s performance. Perhaps more importantly, comparisons of different types and structures of warm-up are being made in controlled studies to determine the effects, if any, of warming-up. Although the optimum warm-up cannot be defined at this point.

Methodology
For this study 20 male hockey players who participated in intra college tournament and were short listed for inter university coaching camp were selected.

To collect the data for the study, the following tests were administered continuously for four days no warming up on the 1st day, after five minutes warming up on second day, after 10 minutes warming-up on 3rd day and after 15 minutes warming-up on the fourth day.

Vertical Jump: Was applied to measure the explosive strength of legs.

Sit and Reach test: Was applied to measure the trunk flexibility.

Shuttle Run: Was applied to measure the agility.

Procedure of Warming -up

i) **On the very 1st day,** no warming up exercises were given and test was conducted without any warming up exercise.

ii) **On the second day,** Tests were followed by giving 5 minutes warming up including alternative slow and fast running for 2.5 minutes and different rotational, stretching and jumping exercises for another 2.5 minutes.

iii) **On the 3rd day,** Tests were followed by giving 10 minutes warming-up exercises which included alternate slow and fast running for 5 minutes and different rotation exercises for another 5 minutes.

iv) **On the 4th day,** Test were followed by giving 15 minutes warming-up exercises which included alternate slow and fast running for 7.5 minutes and different rotational, stretching, Jumping and hopping exercises for another 7.5 minutes.

Analysis of data

The analysis of data was done by one-way analysis of variance (ANOVA) in order to determine the differences if any. When the difference was found significant, the scheff's post-hoc test was applied to access the significant difference among the group means. The level of significances to check the differential effect of different duration of warm-up on selected physical fitness components obtained by F-ratio was set at 0.05.

Table 1: Description analysis of Legs power (Vertical Jump)

	N	Mean	Std. Deviation	Std. Error
Without warming-up	20	29.85	5.60	1.25
With 5 minutes warming-up	20	37.65	7.58	1.69
With 10 minutes warming-up	20	41.35	8.03	1.79
With 15 minutes warming-up	20	45.27	9.81	2.19

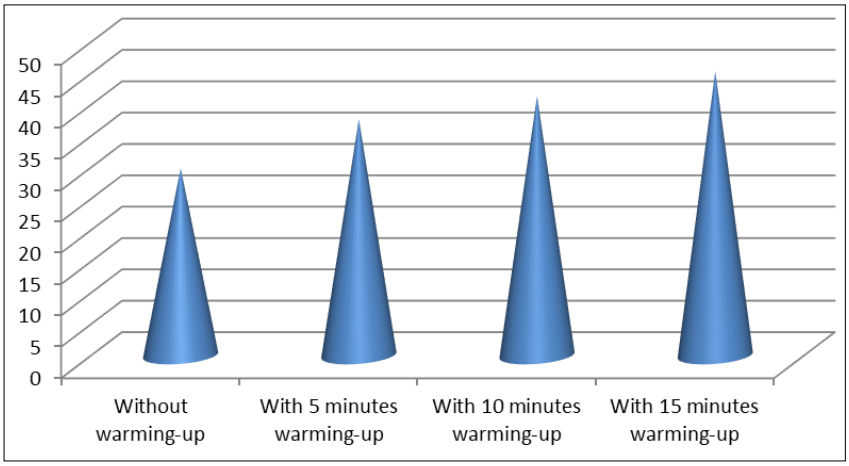

Fig 1: Graphical Depiction of the Means, Leg Power in Cm after different durations of warming–up.

Table 2: One way analysis of Leg Power (ANOVA)

	Sum of squares	df	Mean Squares	F-Value
Between Groups	2591.28	3	863.76	13.06
Within groups	4733.38	76	62.28	-

F. 05 (3,76) =2.72

From the results presented in table it has been observed that there were significant differences among 4 groups in performances as the F-Value of 13.06 was found to be significant at 0.05 level of confidence because it was greater than value of 2.7 required to be significant. As it was found significant, scheef's post –hoc test was applied to find out the mean differences.

No warm-up	5 minutes warm-up	10 minutes warm-up	15 minutes warm-up	M.D	C.D
29.85	37.65	-	-	7.8*	6.49
29.85	-	41.35	-	11.5*	6.49
29.85	-	-	45.27	15.42*	6.49
-	37.65	41.35	-	3.700	6.49
-	37.65	-	45.27	7.62*	6.49
-	-	41.35	45.27	3.920	6.49

It is learnt from above table that there were significant difference in between no warm-up Vs 5 minutes warm-up, no warm-up Vs 10 minutes warm-up, no warm Vs 15 minutes and 5 minutes warm-up Vs 15 minutes warm-up, as the obtained mean differences value of 7.8, 11.5, 15.42 and 7.62 were greater than critical differences value of 6.49. it was also observed that there were no significant mean differences in between 5 minutes warm up Vs 10 minutes warm and 10 minutes warm-up Vs 15 minutes warm up because obtain mean difference value are 3.70 and 3.92 respectively, were less than critical value of 6.49.

Table 3: Description analysis of Trunk Flexibility (Sit and Reach Test)

	N	Mean	Std. Deviation	Std. error
Without warming-up	20	22.85	6.50	1.45
With 5 minutes warming-up	20	28.40	6.01	1.34
With 10 minutes warming-up	20	30.45	6.98	1.60
With 15 minutes warming-up	20	31.80	6.20	1.39

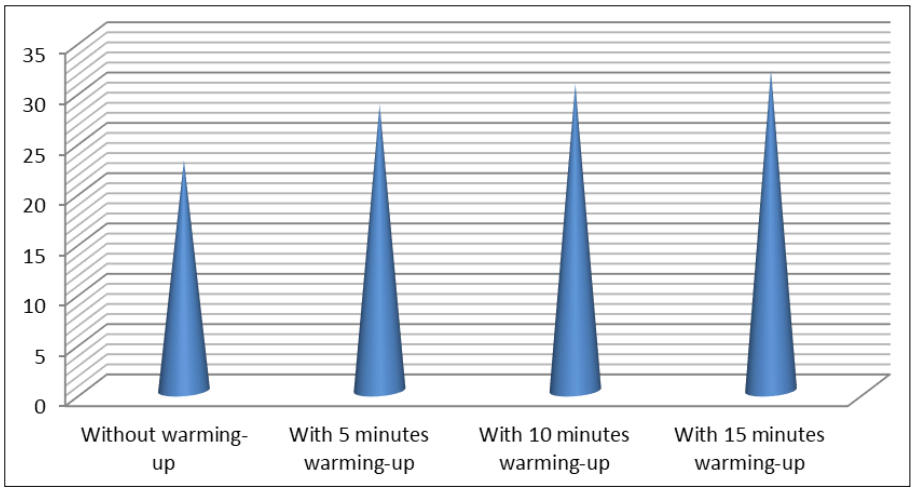

Fig 2: Graphical Depiction of the Means of Hockey players in Trunk Flexibility in Cm after different durations of warming–up

Table 4: One way analysis (ANOVA) of Trunk Flexibility

	Sum of squares	df	Mean Squares	F-Value
Between Groups	931.25	3	310.42	7.5
Within groups	3145.50	76	41.39	-

F. 05 (3,76) =2.72

From the results presented in table it has been observed that there were significant differences among 4 groups in performances as the F-Value of 7.500 was found to be significant at 0.05 level of confidence because it was greater than value of 2.7 required to be significant. As it was found significant, scheef's post –hoc test was applied to find out the mean differences, which is as follows.

No warm-up	5 minutes warm-up	10 minutes warm-up	15 minutes warm-up	M.D	C.D
22.85	28.400	-	-	5.550*	5.250
22.85	-	30.450	-	7.600*	5.250
22.85	-	-	31.800	8.950*	5.250
-	28.400	30.450	-	2.050	5.250
-	28.400	-	31.800	3.400	5.250
-	-	30.450	31.800	1.350	5.250

It is learnt from above table that there were significant difference in between no warm-up Vs 5 minutes warm-up, no warm-up Vs 10 minutes warm-up, no warm Vs 15 minutes and 5 minutes warm-up Vs 15 minutes warm-up, as the obtained mean differences value of 5.550, 7.600, and 8.950 were greater than critical differences value of 5.250. it was also observed that there were no significant mean differences in between 5 minutes warm up Vs 10 minutes warm, 5 minutes warm up Vs 15 minutes warm up,10 minutes warm-up Vs 15 minutes warm up because obtained mean difference value are 2.050, 3.400 and 1.350 respectively, were less than critical value of 5.250.The different mean values are depicted in fig. below.

Table 5: Description analysis of Agility (Shuttle Run Test)

	N	Mean	Std. Deviation	Std. Error
Without warming-up	20	13.30	.95	.21
With 5 minutes warming-up	20	12.38	1.02	.23
With 10 minutes warming-up	20	11.64	.84	.19
With 15 minutes warming-up	20	11.31	.75	.17

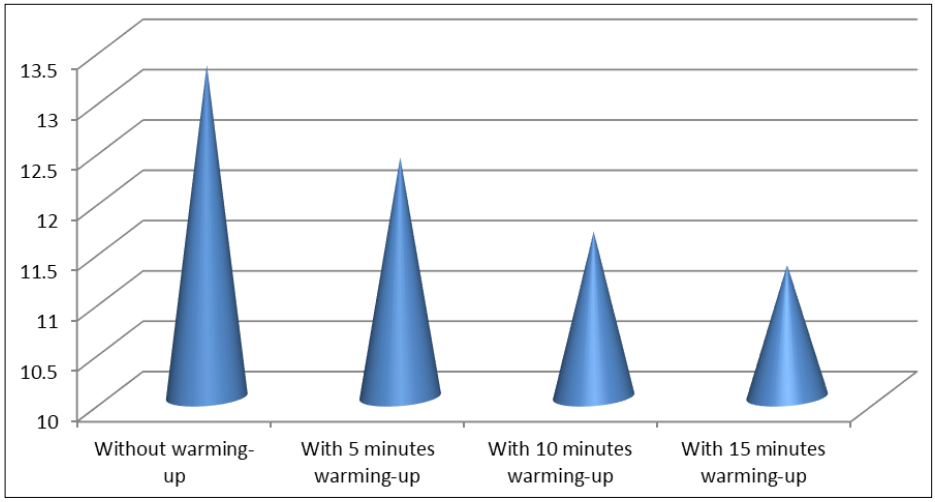

Fig 3: Graphical Depiction of the Means of Hockey players in Agility in Seconds after different durations of warming–up.

Table 6: One way analysis (ANOVA) of Agility

	Sum of squares	df	Mean Squares	F-Value
Between Groups	46.70	3	15.60	19.35
Within groups	61.15	76	.81	-

F. 05 (3,76) =2.72

From the results presented in table it has been observed that there were significant differences among 4 groups in performances as the F-Value of 19.35 was found to be significant at 0.05 level of confidence because it was greater than value of 2.7 required to be significant. As it was found significant, scheef's post –hoc test was applied to find out the mean differences, which is as follows.

No warm-up	5 minutes warm-up	10 minutes warm-up	15 minutes warm-up	M.D	C.D
14.296	12.380	-	-	0.916*	0.738
14.296	-	11.639	-	1.657*	0.738
14.296	-	-	11.309	1.987*	0.738
-	12.380	11.639	-	0.741*	0.738
-	12.380	-	11.309	1.071*	0.738
-	-	11.639	11.309	0.33	0.738

It is learnt from above table that there were significant difference in between no warm-up Vs 5 minutes warm-up, no warm-up Vs 10 minutes warm-up, no warm Vs 15 minutes and 5 minutes warm-up Vs 10 minutes warm-up, and 5 minutes warm up Vs 15 minutes warm up, as the obtained mean differences value of 0.916, 1.657, 1.987, 0.741 and 1.071 were greater than critical differences value of 0.738. It was also observed that there were no significant mean differences in between 10 minutes warm up Vs 15 minutes warm, because obtained mean difference value are 0.33, was less than critical value of0.738.The different mean values are depicted in fig. below.

Conclusion

In the legs power test the subjects have shown better performance after 15 minutes warm-up followed by 10 minutes warm up, 5 minutes warm up and no warm up. Similarly in case of trunk flexibility test, the subjects have shown there better performance after 15 minutes warm followed by 10 minutes warm, 5 minutes warm and no warm up. In case of agility test subjects have shown their better performance after 15 minutes warm, followed by 10 minutes warm, 5 minutes warm up and without warm up.

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