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Impact of dynamic stretching warm-up on 100-meter front crawl performance: A comparative study

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Abstract
The purpose of this study was to examine the effects of dynamic stretching warm-up techniques on swimming performance, focusing on the 100-meter front crawl. We enrolled 15 male swimmers aged 18 to 23 with a background in national-level competitions and a minimum of five years of training experience. The study employed a counterbalanced design, where subjects underwent two trials involving dynamic stretching and traditional water warm-ups, separated by a 48-hour rest period. Performance in the 100-meter front crawl was measured under these varied conditions. Using descriptive statistics and one-way repeated measures ANOVA, our results showed no significant differences in swim performance between the two warm-up methods. The mean times for the dynamic stretching and water warm-up conditions were 66.0853 seconds (SD = 1.64191) and 65.4347 seconds (SD = 1.77521), respectively. These findings suggest that dynamic stretching, as part of a warm-up, does not significantly impact performance in highly trained swimmers performing the 100-meter front crawl. Limitations include the small sample size and the use of a 25-meter pool, which may affect the generalizability of the results. Future studies may benefit from larger sample sizes and varied pool settings to provide more definitive conclusions.

Keywords: Dynamic stretching, swimming performance, 100-meter front crawl, warm-up techniques, athletic performance, counterbalanced trial

Introduction

Sports performance and competitiveness are intertwined concepts within the realm of athletics, reflecting the physical, psychological, and tactical aspects that athletes and teams exhibit in competitive environments. (Khare, Reddy, Kumar, & Sisodia, 2023) [9] Prior to embarking on physical exertion, athletes have traditionally embraced warm-up methodologies as a preparatory measure. Coaches, guided by the belief in their capacity to diminish the likelihood of injury, augment range of motion, and alleviate muscular discomfort, judiciously select these techniques. However, with the progression of knowledge in the realm of stretching methodologies and their typologies, a faction of coaches has begun to deviate from the orthodox approach to warm-up, erring in the application of stretching during this phase. It is imperative to target the pertinent musculature, especially those slated for heightened engagement during the ensuing exercise. While a sundry array of studies has scrutinized the paragon forms of stretching, none have definitively proffered a verdict on the impact of pre-swim stretching on performance.

Stretches are held in a fixed posture for a certain amount of time, often 15 to 30 seconds. Alternatively, dynamic stretching incorporates motions that resemble the action to be done, such arm and leg swings. The effectiveness of these two types of warm-up approaches has been the subject of intense discussion in recent years among swimmers and coaches. Some say the best approach to warm up for swimming is with static stretching, while others support dynamic stretching. (Henrique P. Neiva, 2013) [3]

Dynamic stretching is a method of warming up the body that entails purposeful, controlled movements spanning a complete range of motion. Unlike statics stretching, which entails holding a position for an extended duration, dynamic stretching is distinguished by its continuous, explosive strength, (Nandal & Kumar, 2024) [7] rhythmic motion, progressively enhancing the suppleness and manoeuvrability of muscles and joints.

According to a study, temperature has a significant impact on dissociation curves in both blood and haemoglobin. Physical activity causes oxyhaemoglobin to dissociate quicker, allowing for faster flow via active organ capillaries.

This rise in body temperature, in contrast to usual, contributes in fulfilling higher oxygen demands. (King J. B., 1909) [5]

This study seeks to examine the dynamic of static stretching warm-up techniques on swimmers. Specifically, it aims to investigate how these techniques impact the performance of swimmers in a 100-meter front crawl event.

Material and Methods

Selection of the subjects

For the study, a total of 15 male swimmers was purposively selected. The inclusion criteria were:

a) Players falling in the age range of 18 to 23 years.
b) Players who have participated at national level tournaments.
c) Players who had at least 5 years of training experience.
d) Players who are free from any sort of injuries / mental illness that can affect the data collection process.

Criterion Measures

Performance of swimmers was measured for 100mt. front crawl under the different warming-up and stretching conditions.

Validating

The participants were assigned conditions with warm-up protocols: dynamic stretching and swimming. The warm-up procedure for that particular day was executed as per warm-up protocols. Upon completion of the warm-up procedure, participants were given rest and their pulse rate was recorded by carotid pulse method, before being placed into time trials. Each swimmer then had to swim 100meter sprint in 25meter pool. For each of these swims, participants were instructed to swim using only front crawl. All the timings were recorded to the nearest hundredth of a second and for that stopwatch was used. The record of first 50meter split timings will also be recorded and a total of 100 meter. All the participants had complete two trials in counter balanced manner with the gap of 48 hours between each trial.

Stretching protocol

The Dynamic stretching procedure includes nine stretches that each participant was to be complete. Each stretch was held at mild discomfort for 30 seconds, rest for five seconds, and then complete the same stretch again for another 30 seconds. The nine types of dynamic stretches are shown in table below:

Table 1: Shows dynamic stretching protocol.

Speed Skips	Rapidly skip forward.
Heel-ups	Rapidly kick heels towards buttocks while moving forward.
In and out	Rapidly turn toes in/heels out and toes out/heels in while hopping forward.
Trunk Twists	With arms behind head and body erect, rapidly hop forward as hips are turned to one side then the other, focusing on truck rotation.
Skipping Toe Touches	With arms extended in front of the body, lift one foot toward the extended arms and then skip as the extended leg returns to the floor and the other leg is lifted.
Drop Squat/Carioca	From a standing side stance, hop and land with feet at shoulder width and body lowered to semi squat position; move laterally while rapidly crossing feet over each other.
Power Push-ups	After performing 3 push ups, perform 3 power push ups by quickly pushing your upper body off the ground and clapping your hands.
Sprint Series	While standing erect, fall forward and begin to sprint to the 5 yard mark, then accelerate as fast as possible through the 10 yard mark.
High Knee Skip	While skipping, emphasize high knee lift and arm action.

Table 2: Participants activity chart.

Duration	DAY 1	DAY 2
15-20 min.	Dynamic stretching	Water warm-up
15-20 min.	Water warm-up	Dynamic stretching
20 min.	20 MIN REST INTERVAL	20 MIN.REST INTERVAL
2 min.	TIME TRAILS	TIME TRIALS

Statistical Analysis

To analyse the data Mean, Standard deviation, and one-way repeated measures ANOVA was used to determine whether there is significant difference between the mean of groups.

Results

Table 3: Descriptive Statistics

Descriptive Statistics			
	Mean	**Std. Deviation**	**N**
pre_warmup_ds	65.0853	1.64191	15
post_warmup_ds	65.4347	1.77521	15

Table:3 Indicates the descriptive values of 100m swim performance at warm-up protocols wherein, the Mean and SD at Dynamic Stretching & Water Warmup are 66.0853 & 1.64191; & at water Warmup & Dynamic Stretching are 65.4347 & 1.77521; respectively.

Table 4: Mauchly's Test of Sphericity

Mauchly's Test of Sphericity[a]							
Measure: MEASURE_1							
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
factor1	1.000	.000	0	.	1.000	1.000	1.000
Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.							
a. Design: Intercept Within Subjects Design: factor1							
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.							

Table:4 Indicates that the value of Mauchly's test statistic was insignificant for the scores of 100m swim performance at various warm-up protocols as the p-value is greater than 0.05 level of significance i.e., p=.0. So, in this case, it can be asserted that the assumption of Sphericity is considered to be fulfilled. Therefore, the researcher employed the test of one-way repeated measures ANOVA to test the within subject effect of various warm protocols.

Table 5: Tests of Within-Subjects Effects

Tests of Within-Subjects Effects						
Measure: MEASURE_1						
Source		Type III Sum of Squares	df	Mean Square	F	Sig.
performance	Sphericity Assumed	.915	1	.915	.317	.582
	Greenhouse-Geisser	.915	1.000	.915	.317	.582
	Huynh-Feldt	.915	1.000	.915	.317	.582
	Lower-bound	.915	1.000	.915	.317	.582
Error(performance)	Sphericity Assumed	40.404	14	2.886		
	Greenhouse-Geisser	40.404	14.000	2.886		
	Huynh-Feldt	40.404	14.000	2.886		
	Lower-bound	40.404	14.000	2.886		

Table:5 Shown indicate that there is no significant difference in 100m swim performance at various warm-up protocols i.e., Dynamic Stretching & Water Warmup, Water Warmup & Dynamic Stretching, as the p-value (0.582) is greater than 0.05. Hence, on the basis of the results, it can be concluded that there is no significant effect on 100m swim performance at various warmup protocol after performance.

Table 6: Performance

Performance				
Measure: different_stretching_methods				
factor1	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	65.085	.424	64.176	65.995
2	65.435	.458	64.452	66.418

A pairwise comparison is shown in Table-6 between 100m swim performance at different warmup protocols wherein the mean differences showed no significant effect between the performance at different levels.

Discussion on Findings

The primary outcome of this study was that dynamic stretching warm-up protocols did not significantly enhance performance in the 100-meter front crawl among highly trained swimmers. This finding is supported by the within-subjects ANOVA, which indicated no significant differences in swim times between the two warm-up methods (p = 0.582). The lack of significant improvement with dynamic stretching may suggest that for athletes already performing at high levels, the benefits of such warm-up modifications might be minimal.

Several studies align with our findings, suggesting minimal or no benefit from dynamic stretching on performance in short-duration, high-intensity activities. A meta-analysis by Simic *et al*. (2012) [10] concluded that dynamic stretching, while beneficial for increasing range of motion, does not significantly enhance performance in subsequent athletic activities compared to other warm-up routines. Similarly, research by Amiri-Khorasani *et al*. (2010) [1] observed no significant improvements in sprint times following dynamic stretching among soccer players.

However, other studies have shown contrasting results. For instance, Needham *et al*. (2009) [8] reported improvements in sprint performance after dynamic stretching compared to static stretching or no stretching. These discrepancies can be attributed to differences in the athletic background of participants, the specific movements used in dynamic stretches, or the duration and intensity of the stretching routines. The current study's outcomes may also be influenced by psychological and physiological factors inherent to high-level competition. Factors such as mental preparedness, muscle fatigue, and individual variability in responsiveness to warm-up routines can significantly affect performance outcomes, as noted by Bishop (2003) [2] and (Jadaun, Kumar, Singh, & Sisodia, 2021) [4]. Furthermore, the high baseline performance level of the athletes involved may mean that any potential gains from different warm-up strategies are too small to detect without a much larger sample size or more sensitive measuring techniques. Our study's methodology, including the use of a counterbalanced design and repeated measures ANOVA, was intended to control for individual differences and potential biases. The findings are robust in the context of the tested population but may not generalize to other populations, such as less experienced swimmers or those competing in longer distances.

The limitations of this study include its small sample size and the use of a 25-meter pool, which might not accurately represent conditions in other competitive settings, such as 50-meter pools used in many international competitions. Future research could explore the effects of dynamic stretching on swimming performance in different contexts and with larger, more diverse populations. Additionally, examining the impact of combining dynamic stretching with other warm-up components, like aerobic exercises, (Kumar, Khare, & Sisodia, 2021) [6] could provide insights into more effective warm-up routines.

Overall, while our study adds to the body of literature suggesting limited effects of dynamic stretching on performance in short swimming events among elite athletes, it also highlights the need for ongoing research to explore the nuances of sports-specific performance enhancement strategies.

Conclusion

The study sought to discover how different warm-up methods affect swimming performance. To accomplish this, participants in an experiment followed a standardised warm-up procedure on two distinct days before participating in a 100m swim performance.

According to the findings, varied stretching warm-up procedures included in the warm-up before and after water warm-up had a negligible effect. This might be because the participant's performance levels were already at the pinnacle. Other psychological and physiological aspects were important in the investigation, therefore the influence of stretching warm-up routines was not seen. The number of participants also has an impact on the data findings; in the study, only 15 students were chosen, which is a tiny sample size for finishing the study. Only a 25-meter swimming pool was provided. A paired evaluation of 100m swim performance at different warmup regimens is provided in (Table-6), with the mean differences showing no significant influence between the performance at different circumstances.

References

1. Amiri-Khorasani M, Sahebozamani M, Tabrizi KG, Yusof AB. Acute effect of different stretching methods on Illinois agility test in soccer players. Journal of Strength and Conditioning Research. 2010;24(10):2698-2704.
2. Bishop D. Warm Up I: Potential Mechanisms and the Effects of Passive Warm Up on Exercise Performance. Sports Medicine. 2003;33(6):439-454.
3. Henrique P. Neiva, M. C. Warm-up and Performance in Competitive Swimming. Sports Medicine. 2013, p. 319-330.
4. Jadaun R, Kumar A, Singh SLK, Sisodia A. A Comparative Study of Covid-19 Pandemic on Mental Toughness of National Level Players of Selected Team Games. NVEO-Natural Volatiles & Essential Oils Journal| NVEO, 2021, 6583-6587.
5. King JB. The effect of temperature on the dissociation curve of blood. The Journal of Physiology. 1909, 374-384.
6. Kumar A, Khare SP, Sisodia A. An Aerobic Capacity Variable-Based Discriminant Model For The Classification Of Handball Players. NVEO-Natural Volatiles & Essential Oils Journal| NVEO, 2021, 6544-6548.
7. Nandal A, Kumar A. A comparative analysis of lower limb explosive strength between judo and Kho-Kho players. Journal of Sports Science and Nutrition. 2024;5(1):25-26.
8. Needham RA, Morse CI, Degens H. The acute effect of different warm-up protocols on anaerobic performance in elite youth soccer players. Journal of Strength and Conditioning Research. 2009;23(9):2614-2620.
9. Shashvat Priyam Khare, Prof. Onima Reddy T, Dr. Ajay Kumar, Dr. Anurodh Sisodia. Muscle architecture and sports performance. Journal of Sports Science and Nutrition. 2023;4(2):254-257.
10. Simic L, Sarabon N, Markovic G. Does pre-exercise static stretching inhibit maximal muscular performance? A meta-analytical review. Scandinavian Journal of Medicine & Science in Sports. 2012;23(2):131-148.