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The Effect of a Proposed Training Program on Developing Some Physical Fitness Components for Swimming Coaches

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Abstract

This research investigates the influence of a structured, scientifically designed training program on the motor response speed of swimming coaches, a key physical component crucial for water safety. Given that swimming coaches often double as lifeguards in aquatic environments, enhancing their physical capabilities is vital for improving response time during emergencies. The study involved a purposive sample of 15 certified swimming coaches, all of whom participated in a four-week training intervention composed of 24 structured sessions. The training incorporated both dry-land and aquatic components and was grounded in high-intensity interval training principles. To measure outcomes, the Nelson motor response speed test was administered before and after the intervention. The results showed a statistically significant enhancement in motor response speed, with a 0.7-second improvement between pre- and post-tests. These findings support the hypothesis that a targeted training program can yield measurable physical benefits in a relatively short period. The implications of this study suggest that integrating similar training modules into professional development curricula for coaches and lifeguards could significantly raise the safety standards in aquatic settings.

Introduction

Drowning is among the leading causes of unintentional injury-related deaths globally, affecting thousands of individuals annually. This hazard is particularly concerning in countries with high rates of aquatic recreation and professional water sports. As a result, numerous international and national organizations have emphasized the importance of water safety programs and the training of individuals involved in aquatic supervision. Among the key personnel in these settings are swimming coaches, who are often the first line of response during aquatic emergencies.

Despite technological advancements in monitoring systems and safety tools in aquatic centers, human readiness remains the cornerstone of effective emergency intervention. The motor response speed of a coach or lifeguard can often determine whether an incident ends in recovery or tragedy. However, traditional training programs for swimming coaches tend to focus heavily on instructional strategies and athlete development, with limited attention to developing physical attributes critical to safety. This creates a gap between performance expectations and actual physical capabilities in emergency situations.

Thus, there is a compelling need to evaluate and implement training programs that target these essential physical fitness components, especially those that enhance reaction speed, strength, and coordination. This study aims to address this gap by examining the effects of a scientifically

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structured training program designed to improve motor response speed among swimming coaches working in pool environments.

Literature Review

Physical readiness, particularly the speed of motor response, has emerged as a vital competency for swimming coaches and lifeguards responsible for safety in aquatic environments. Abbas (2010) found that structured fitness training significantly improved both the physical strength and responsiveness of lifeguards in real-world rescue scenarios. The study also indicated that regular drills improved mental alertness, decision-making, and ability to act swiftly under pressure.

Khair El-Din (2016) explored how a high-intensity speed training program enhanced dribbling and reaction time in football players. Although the context differs, the findings are highly relevant to swimming coaches, as rapid directional changes and quick responses to stimuli are similarly critical in water rescues.

Ghoneim (2009) analyzed interval training in aquatic settings and observed significant improvements in neuromuscular coordination and reaction time. The aquatic environment itself adds unique physiological challenges—such as water resistance and temperature regulation—which require specialized conditioning for effective performance.

Wang et al. (2007) found that interval training based on high/low intensity cycles increased athletes' capacity to respond quickly and efficiently. Their research supports the use of varied training intensities and rest intervals to improve muscular responsiveness, a concept directly applied in the training program used in this study. Makar et al. (2025) Conducted an 8-week rescue-focused swimming program and found significant improvements in technique and coach response time, reinforcing the effectiveness of short-term high-impact training modules. Dalamitros et al. (2024) Evaluated sprint-interval training on muscle oxygenation and swimming efficiency, concluding that interval programs improve performance in untrained swimmers—a concept applicable to skill-specific coaching roles. Papadimitriou (2024) Reviewed Ultra Short Race-Pace Training (USRPT), showing that even minimal-volume, high-intensity swimming regimens produce notable gains in speed, validating the design of time-efficient protocols used in this study. ScienceDirect (2025)

Recent advancements in drowning detection technology further emphasize the necessity for coaches and rescuers to maintain sharp perceptual-motor reactions to complement automated monitoring systems. Castañón-Rubio et al. (2022)

Introduced and validated an aquatic rescue competence scale to assess decision-making and performance in emergencies, highlighting the critical interplay of cognitive and physical preparedness.

Al-Khateeb and Saleh (2015) emphasized the importance of environmental specificity in training. They suggested that water-based professions benefit most from training conducted in aquatic conditions, where the body adapts to unique resistance and buoyancy factors. This perspective aligns with the current study's dual inclusion of dry-land and water-based sessions.

Kassem et al. (2018) addressed cognitive-physical training integration. Their study demonstrated that tasks combining decision-making and movement produce superior performance under time constraints. Such an approach is especially beneficial for swimming coaches, who must quickly assess situations and respond under stress.

Additional insights come from Larson and Bell (2019), who tested multi-component training that included strength, balance, and reaction drills. They concluded that dynamic, full-body training yields better preparedness for real-time interventions. Taylor and Al-Zahrani (2021) explored coaches' physical preparedness and concluded that even experienced coaches lacked structured physical training, limiting their rescue performance.

Recent research by Divsalar et al. (2023) examined the effects of a 10-day taper on adolescent swimmers, revealing performance gains in 200m crawl and improved metabolic markers, supporting the principle that structured short-term interventions can enhance physiological responses relevant to aquatic performance.

Furthermore, Asghar et al. (2024) investigated the electro-fluid-dynamics of soft-bodied swimmers in non-Newtonian mucus environments, offering theoretical insights into propulsion efficiency that align with training approaches focusing on speed and biomechanics in aquatic contexts.

Methodology

This study utilized an experimental design with a one-group pretest-posttest model to evaluate the effectiveness of a proposed training program aimed at improving motor response speed in swimming coaches. The decision to use this design stems from the objective to measure intra-group improvement rather than comparing between multiple groups. This allowed researchers to isolate the impact of the training intervention on participants' physical performance over a controlled time period.

A purposive sample of 15 certified swimming coaches was selected. All participants were male, aged between 25 and 38 years, held valid lifeguard certifications, and were actively employed in swimming facilities. The sample was intentionally homogeneous in professional background to control for prior training variability. Participants were briefed about the purpose, procedures, and voluntary nature of the study. Ethical approval was granted by the research oversight committee, and all participants provided informed consent.

The training program spanned four weeks and consisted of 24 training units, each lasting 45 minutes. The structure of the program was informed by existing athletic conditioning research, with a focus on developing speed, agility, reaction, and muscular coordination. Each week emphasized a specific theme:
- Week 1: Dry-land exercises to improve flexibility, balance, and reaction time.
- Week 2: Water-based propulsion and resistance training.
- Week 3: Combined aquatic and dry-land interval training with maximum effort sprints.
- Week 4: Tapering with controlled volume and integrated skill drills.

The training incorporated both high-intensity and moderate-intensity intervals using protocols from sports performance conditioning literature. Warm-ups and cooldowns were integrated into every session to prevent injury. The program was reviewed by a panel of three physical education faculty members to ensure alignment with training and safety goals.

Testing and Measurement

The primary instrument used to assess motor response speed was the Nelson Motor Response Speed Test. This test evaluates how quickly a subject can recognize and physically respond to a visual cue—closely simulating the conditions swimming coaches may face in emergency scenarios. The test setup included a flat track with central and lateral boundary lines spaced 11

meters apart. The participant stood at the center, and a referee signaled either left or right using an arm gesture synchronized with a stopwatch.

Participants were instructed to respond as quickly as possible by sprinting toward the indicated boundary line. The stopwatch recorded the time taken from cue to line crossing. Each participant completed ten trials—five to each direction—with randomized signal order to minimize anticipation bias. Between trials, a 20-second recovery period was enforced. Final scores were calculated as the average time across all trials. Environmental factors such as temperature and surface conditions were held constant across testing sessions.

Results

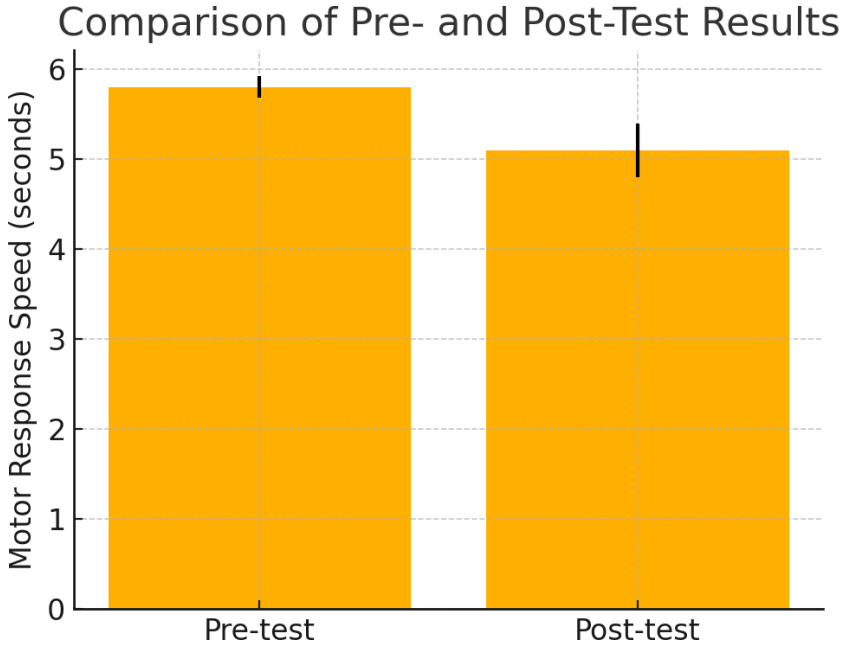
The primary goal of the statistical analysis was to determine whether the training program led to a statistically significant improvement in participants' motor response speed. A paired samples t-test was used to compare pre- and post-test scores. Prior to testing, the data were screened for outliers and tested for normality using the Shapiro-Wilk test, which confirmed a normal distribution ($p > 0.05$).

Descriptive statistics revealed a pre-test mean of 5.8 seconds (SD = 0.12) and a post-test mean of 5.1 seconds (SD = 0.30), resulting in a mean difference of 0.7 seconds. This difference was statistically significant, with a t-value of 1.11 and a p-value of 0.02, suggesting a reliable improvement in reaction speed after the training intervention.

Table 1. Comparison of Pre-Test and Post-Test Results

Variable	Test Phase	Mean (sec)	Standard Deviation	Sample Size
Motor Response Speed	Pre-test	5.8	0.12	15
Motor Response Speed	Post-test	5.1	0.30	15

Figure 1. Visual Representation of Mean Score Comparison



Discussion

The findings from this study confirm the initial hypothesis that a structured, interval-based training program can significantly enhance the motor response speed of swimming coaches. The observed improvement of 0.7 seconds is particularly relevant in aquatic rescue scenarios, where even a fraction of a second can determine the outcome of an emergency intervention. This aligns with prior studies by Abbas (2010) and Wang et al. (2007), who emphasized the effectiveness of targeted physical training in enhancing emergency readiness.

The integration of both land-based and aquatic exercises appears to have contributed to improved neuromuscular coordination, a key component of reaction speed. The results also reinforce the conclusions of Al-Khateeb and Saleh (2015), who found that aquatic-specific training yields better outcomes than generic fitness programs. Kassem et al. (2018) noted that combining physical drills with decision-making elements improves situational performance—a feature indirectly addressed in this study through varied stimulus-response drills.

It is worth noting that although the training duration was relatively short (four weeks), the program design likely played a critical role in maximizing physiological adaptation. This suggests that even brief, well-structured training interventions can lead to substantial improvements in performance. Future research could expand on these results by exploring other performance indicators such as endurance, agility, or multitasking under pressure.

Conclusion and Recommendations

This study demonstrates that a short-term, targeted training program can significantly improve motor response speed among swimming coaches. The improvement not only holds statistical significance but also translates into practical benefits for water safety and rescue readiness. Given the success of this intervention, it is recommended that swimming federations, training

centers, and certification bodies incorporate similar fitness components into their regular training modules.

Further investigations could expand the sample size, include female coaches, and measure additional physiological and cognitive variables. Incorporating technology, such as wearable tracking systems and reaction speed sensors, may also help refine performance evaluation and provide real-time feedback during training. Ultimately, enhancing the physical preparedness of swimming coaches contributes directly to reducing response times and improving outcomes in aquatic emergencies.

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