

## Effect of Verbal Encouragement and Performance Feedback on Running Distance in Yo-Yo Intermittent Recovery Tests

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### Abstract

The aim of this study is to investigate the effect of performance feedback (PF) and verbal encouragement (VE) on the running distances of amateur football players in Yo-Yo intermittent recovery tests (Yo-Yo IR 1 and 2). For this purpose, thirty-four young amateur football players voluntarily participated in the study and the participants were divided into two different groups, AT1 (n=17) and AT2 (n=17), using a random method. The running distance of the participants in IR1 and IR2 tests was tested on three different non-consecutive days without any external stimulus (NES) and using external motivation stimuli (VE and PF). Each measurement protocol was applied 72 hours apart to eliminate the effect of fatigue between measurements. In the analysis of the data, the suitability of the variables to normal distribution was examined using visual and analytical methods. The effects of different conditions (NES, VE and PF) on two different test protocols (IR1 and IR2) were analyzed by repeated measures ANOVA. Homogeneity of variances was examined with Mauchly's sphericity test, and when the assumption was not met, the Greenhouse-Geisser correction was applied. Multiple comparison analyses were applied using the Bonferroni, when statistically significant differences were detected between the conditions. According to the analysis results, the running distance obtained after PF was significantly higher ( $p<0.05$ ) compared to VE and NES in the IR1 test. In the IR2 test, although there was no statistically significant difference between the running distances obtained after PF and VE, when compared to NES, the average running distances obtained after PF and VE were significantly higher ( $p<0.05$ ). As a result, it can be suggested that coaches and strength and conditioning professionals could strategically implement external motivational interventions during training and testing sessions to increase athletes' effort levels and improve performance outcomes.

**Keywords:** Football, Verbal encouragement, Performance feedback, Running distance

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## INTRODUCTION

Physiological tests provide important information about the physical capabilities and training status of athletes (Virus & Virus, 2001). Various evaluation techniques are used in soccer to assess the physiological characteristics of players and the physical demands of the games (Can & Cihan, 2013). To evaluate aerobic performance, a variety of laboratory and field tests have been developed, including shuttle run tests conducted in the field and treadmill test to determine maximum oxygen uptake (Leger & Lambert, 1982; Ramsbottom et al., 1988). Most of the evaluations involve continuous exercises. However, the ability of the athletes to repeatedly perform intense exercise is what determines their performance in many sports, including ball games such as soccer, where the exercise is intermittent. As a result, it makes sense to assess an athlete's capacity for sustained, high-intensity exercise and, consequently, his capacity for recovery from such activities (Krustrup et al., 2003).

Yo-Yo intermittent recovery tests (Yo-Yo IR) were designed by Bangsbo (1994), inspired by the multi-stage shuttle run test designed by Leger and Lambert (1982), to evaluate the ability of athletes competing in team or individual sports to perform repeated intense exercises and to recover after exercise. Yo-Yo tests are regarded as one of the most reliable ways to measure an athlete's conditioning performance among field tests (Krustrup et al., 2003). In Yo-Yo IR tests, athletes run in a 2x20 meter area where their running speed is controlled by an auditory signal. They walk or jog for a brief recovery period in between each shuttle run, which reflects the exercise example in an intermittent sport (Bangsbo et al., 2008). It can be suggested that Yo-Yo IR tests are sensitive and reliable for identifying the distinctions between athletes participating in various sports, competing at different levels, and occupying various positions, as well as between seasons or periodic variations in physical ability (Can & Cihan, 2013).

Performance is defined as a set of behaviors or actions that are observed during a contest or competition and help in individual's success (Thompson, et al., 2010). Even the slightest variations can make the difference for athletic success at the most competitive levels (Facer-Childs et al., 2018). Because of this, over the years, sports scientists have looked for various strategies to enhance their athletic performance (Atan, 2013). Sports performance research seeks to find strategies that improve performance in order to optimize both mental and physical performance (Facer-Childs et al., 2018). It is not easy to motivate an athlete to show maximum effort during training, competition or any application (Pacholek & Zemkova, 2022). The biggest role is played by motivation, which is the reason for people's behavior, desires and needs (Elliot & Covington, 2001). According to Rothman et al., (1993), there is a strong correlation between success and motivation during performance tests. Those who score higher than expected on these tests are said to be more motivated.

It is commonly acknowledged by athletes, coaches, sports psychologists, and the larger sports community that motivation—which is defined as the desire to do something—is a factor that can both negatively and positively impact physical performance and is a major predictor of success or failure in sports (Ryan & Deci, 2000). Since it is thought that motivated athletes have a higher chance of success, coaches frequently help athletes work hard to succeed and employ particular techniques to "motivate" their athletes. This is known as an important part of coaching practice (Ntoumanis & Mallett, 2014).

There are several ways to increase athletic performance through extrinsic motivation (Dallaway et al., 2022). Verbal encouragement (VE) is one of the frequently used methods to increase or

encourage individuals to sustain their performance during maximal exercise tests (Halperin et al., 2015). The effects of VE on athletic performance have been the subject of numerous studies. Tenenbaum and Eklund (2020) proposed that verbal support improves athletes' performance during competition and training. Additionally, studies have demonstrated that verbal encouragement greatly enhances performance on maximal exercise tests, with VO<sub>2</sub>max and time to exhaustion during multistage shuttle run tests increasing by 8% to 18% (Andreacci et al., 2002; Chitwood et al., 1997; Moffatt et al., 1994; Neto et al., 2015). In a study involving male participants who had not received training, Karaba-Jakovljevic et al., (2007) obtained that VE enhanced performance on the wingate anaerobic test (WanT). In contrast, Bullinger et al., (2012) found that VE had no effect on WanT performance in either the female athlete or non-athlete groups. A study of male judo athletes found that VE had no effect on hand grip muscle strength (Obminski & Mroczkowska, 2015). This suggests that VE can help all athletes during maximal exercise tests and tends to improve longer-term test performance (Midgley et al., 2018).

Performance feedback (PF), which gives athletes information to help them maintain or improve their performance, is one of the techniques that coaches and researchers use most frequently to help athletes perform better in sports (Ward, 2011). Extrinsic PF can be communicated in two ways: knowledge of results, which includes information about the movement pattern that produced the result, and knowledge of performance, which includes information about the result of the action (Moslovat & Franks, 2020). According to Bandura (1997), PF increases self-efficacy, which in turn helps people perform better in difficult situations. Additionally, it has been proposed that giving PF may influence psychological processes, such as greater motivation for strength and conditioning exercises, in addition to improving performance (Weakley et al., 2020; Wilson et al., 2017; 2018).

Many research studies have examined how specific external stimuli affect athletic performance or fitness tests (Bucciarelli, 2024; Dobiasch et al., 2021; Halperin et al., 2015; Karaba-Jakovljevic et al., 2007; Tenenbaum and Eklund, 2020; Pacholek, 2023). To our knowledge, there is no study investigating the effects of two distinct external stimuli in the same study to improve the performance of the Yo-Yo IR (level 1 and 2).

Thus, the aim of our study was to investigate how verbal encouragement (VE) and performance feedback (PF) affected the running distance of amateur football players in Yo-Yo IR tests. This aim is quite valuable in determining whether verbal encouragement and performance feedback, which are frequently used as a motivation tool by coaches or fitness trainers during training, have a positive effect on running performance during an intermittent field test, which is widely used to determine the aerobic characteristics of athletes competing in intermittent sports. It was hypothesized that external stimuli (VE and PF) would have a greater effect on running distance of amateur football players in the Yo-Yo IR tests.

## METHOD

### Research Model

The study employed a within-subjects experimental research design with repeated measures involving 34 participants to determine the effects of three interventions-verbal encouragement (VE), performance feedback (PF) and, no external stimulus (NES)-on running distance in Yo-Yo intermittent recovery test (Yo-Yo IR).

### Research Groups

Thirty-four young football players (age:  $17.1 \pm 0.9$  years; height:  $177.7 \pm 6.1$  cm; body mass:  $68.2 \pm 6.5$  kg) who trained regularly at least five days a week voluntarily participated in this study, and no payment was provided for their participation. The participants were randomly assigned into two different groups as Yo-Yo IR1 ( $n=17$ ) and Yo-Yo IR2 ( $n=17$ ). The physical characteristics of the participants are given in Table 1. Power analysis showed that a minimal sample size of 17 was needed for a confidence interval of 95%, while the error probability ( $\alpha$ ) was set at 0.05. The G-power analysis software version 3.1.9.7 (University of Düsseldorf, Germany) was used for the minimal sample size calculation (Faul *et al.*, 2007). Based on these parameters, minimum effect size (Cohen's  $f$ ) of 0.33 was established (Bayrakdaroğlu *et al.*, 2022), yielding an actual power of 80%. The participants attended football training sessions three days a week, each lasting approximately 90 minutes. In addition, they applied resistance training twice a week for about 90 minutes and played one official match on weekends.

The inclusion criteria for the study were: (i) being between 16 and 19 years of age, (ii) having participated in regular football training for at least five years, (iii) regularly attending training sessions and matches, (iv) signing the informed consent form, and (v) committing to fully participate in all measurements. The exclusion criteria were: (i) the use of any medication that could adversely affect the study results, and (ii) having a history of lower body injuries within two months prior to or during the study. Additionally, goalkeepers were excluded from the study owing to the differences in their physical outputs compared to players in other positions. Participants were instructed to avoid alcohol and physical activities (for 24 hours), smoking (> 2 hours), consumption of any stimulants (energy drinks and caffeine), and eating (> 3 hours) prior to the tests to prevent any negative effects on their performance. They were also asked to adequate sleep the night before (> 7 hours) and to perform the test protocol with maximal effort (Dallaway *et al.*, 2022). All participants were informed both verbally and in writing about the aims and procedures of the study, were told that they had the right to withdraw at any time, and provided written informed consent indicating their voluntary participation.

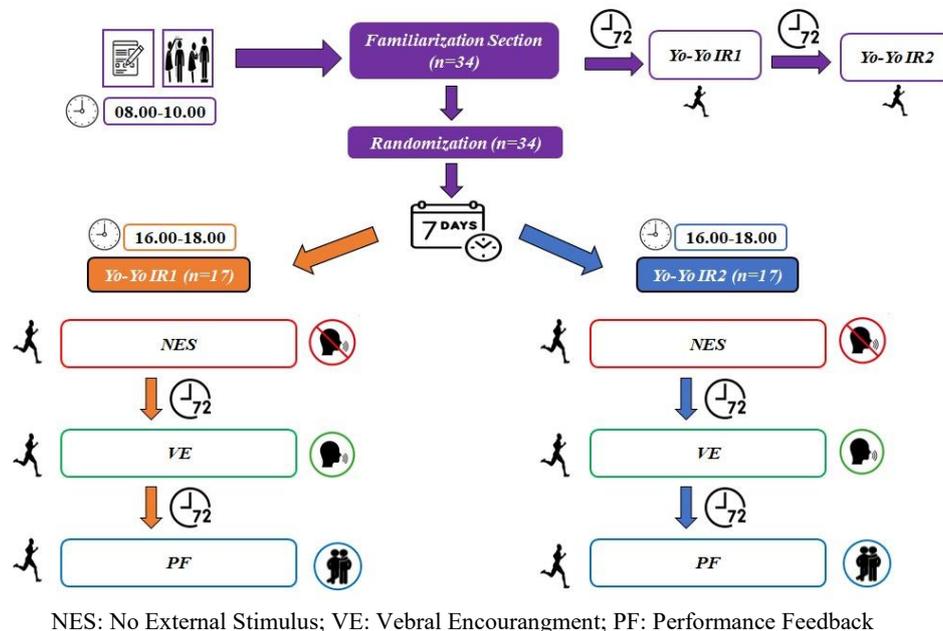
### Procedures

As shown in Figure 1, the protocol began with a familiarization session one week before the measurements, during which participants were introduced to the testing procedures and physical characteristics of the participants were also determined using standard methods. The running distances of the participants in the Yo-Yo IR1 and IR2 tests were assessed on three non-consecutive days, under two conditions: without any external stimuli and with external stimuli (verbal encouragement and performance feedback). Each protocol was performed with a 72-hour rest to eliminate the effects of fatigue between measurements. The first test attempt was performed without any external stimuli (Pacholek & Zemkova, 2022).

Prior to the measurements, participants completed a standardized warm-up protocol consisting of 10 minutes of low-intensity running (at 40% of their maximum heart rate) and 5 minutes of stretching exercises targeting both the lower and upper body. To ensure consistency across all experimental protocols and to minimize the effects of circadian rhythms on performance, all tests were conducted at the same time of day (between 16:00 and 18:00) and under identical environmental conditions (temperature: 18–22°C; relative humidity: 45–55%).

All test procedures and warm-up sessions were conducted by the same researcher to standardize the amount and frequency of verbal encouragement and feedback (Pacholek, 2021). In accordance with international ethical standards for research on human biological rhythms (Portaluppi et al., 2010), all tests were performed on an artificial turf football field using standardized equipment during the mid-season break, when league competitions were paused, to eliminate the negative effects of match performance on the test results. The external motivation techniques used in the study were as follows;

- No External Stimulus (NES) Phase*: Following the standardized warm-up protocol, the tests were administered without any external stimuli provided to the participants.
- Verbal Encouragement (VE) Phase*: Following the standardized warm-up protocol, the tests were administered by providing athletes with positive verbal encouragement (e.g., "go, go, go", "perfect", "you can do better", "never give up") of consistent quantity and quality throughout the test duration.
- Performance Feedback (PF) Phase*: Following the standardized warm-up protocol, the tests were administered by providing participants with immediate verbal feedback on their running speeds and distances after each running bout.



NES: No External Stimulus; VE: Verbal Encouragement; PF: Performance Feedback

**Figure 1.** Experimental design of the study

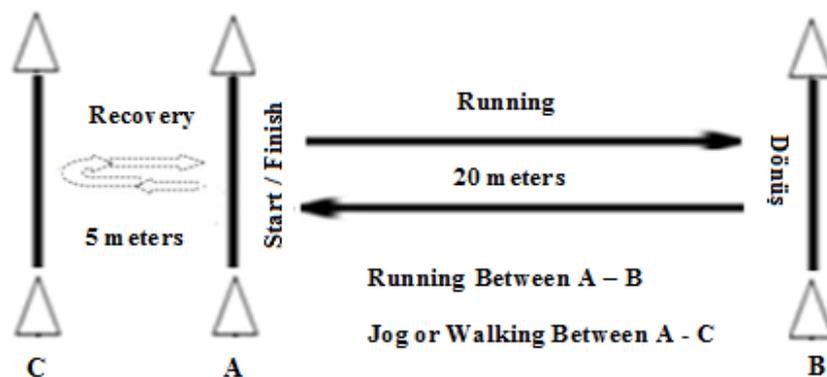
## Ethics Approval

The study was approved as complying with the principles of scientific research and publication ethics by the Scientific Research and Publication Ethics Committee of Iğdır University during its meeting held on December 9, 2024 (Decision No: 2024/33).

### Collection of Data

Participants' height was measured in the anatomical position, with body weight evenly distributed between both feet, using a wall-mounted stadiometer (Seca, Hamburg, Germany) with a precision of 0.01 cm, by recording the distance between the vertex of the head and the soles of the feet in centimeters (cm). Body weight was assessed in kilograms (kg) using a digital body composition scale (Tanita BC418, Tokyo, Japan) with a precision of 0.01 kg. All measurements were taken barefoot, with participants wearing only shorts and a t-shirt.

Participants' running distance was assessed using the Yo-Yo Intermittent Recovery Tests (Yo-Yo IR1 and Yo-Yo IR2) developed by Bangsbo (1994) (Figure 2). These tests involve  $2 \times 20$ -meter shuttle runs (out and back) performed at progressively increasing speeds. The initial running speed is set at 10 km/h for Yo-Yo IR1 and 13 km/h for Yo-Yo IR2. Running speeds are controlled via auditory signals emitted from a portable CD player. Each running lane, marked with cones, includes an active recovery zone located 5 meters behind the starting line, where players can walk, jog, or remain stationary for 10 seconds after each  $2 \times 20$ -meter shuttle. Players must return to the starting line before the recovery time expires and be ready to start the next run upon hearing the auditory signal. The test was terminated either when players failed twice to reach the finish line in time (i.e., missed the signal) or voluntarily withdrew (exhaustion). The total distance covered up to the last completed stage was recorded as the test score (Bangsbo et al., 2008; Can & Cihan, 2013).



**Figure 2.** Visual presentation of Yo-Yo intermittent recovery tests (Can & Cihan, 2013)

### Analysis of Data

Statistical analyses were conducted using the JASP 0.19.3.0 software package (Netherlands). The normality of the variables was assessed through both visual (histograms and probability plots) and analytical (Shapiro-Wilk Test) methods. The effects of the different conditions (NES, VE, and PF) on the two test protocols (IR1 and IR2) were analyzed using repeated measures ANOVA. The homogeneity of variances was evaluated with Mauchly's test of sphericity; when the assumption of sphericity was violated, the Greenhouse-Geisser correction was applied. In cases where statistically significant differences were found among the conditions (NES, VE, and PF), multiple comparisons were performed using the Bonferroni method. Partial eta-squared ( $\eta^2p$ ) values were calculated to estimate effect sizes and were interpreted as small ( $<0.06$ ), medium ( $0.06-0.13$ ), and large ( $\geq 0.14$ ) according to Lakens (2013). Mean values were analyzed for all measurements, and a significance level of  $p < .05$  was set.

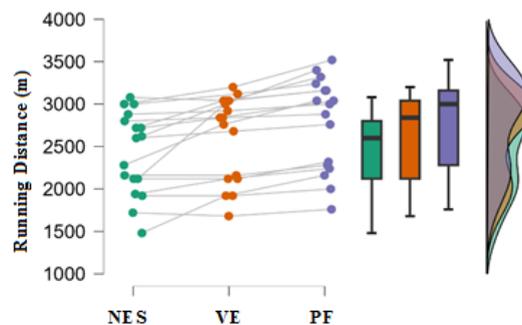
## FINDINGS

The demographic characteristics of the participants are presented in Table 1. In the Yo-Yo IR1 group, the mean values were 17.05 ( $\pm 0.97$  years) for age, 177.9 ( $\pm 7.34$  cm) for height, and 67.05 ( $\pm 6.59$  kg) for body weight. In the Yo-Yo IR2 group, the corresponding mean values were 17.2 ( $\pm 0.98$  years) for age, 177.6 ( $\pm 4.86$  cm) for height, and 69.4 ( $\pm 6.56$  kg) for body weight.

**Table 1.** Demographic characteristics of the participants

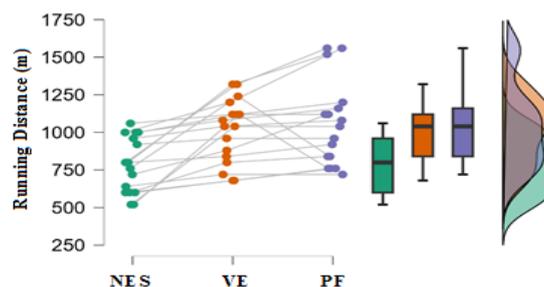
Variables	All Group (n=34)		Yo-Yo IR1 (n=17)		Yo-Yo IR2 (n=17)	
	$\bar{x}$	$\pm SS$	$\bar{x}$	$\pm SS$	$\bar{x}$	$\pm SS$
Age (Years)	17.1	0.97	17.05	0.97	17.2	0.98
Height (Cm)	177.7	6.13	177.9	7.34	177.6	4.86
Weight (Kg)	68.2	6.58	67.05	6.59	69.4	6.56

Statistically significant differences in running distance (m) were observed between the NES, VE, and PF conditions in both the Yo-Yo IR1 ( $F=20.651$ ;  $p<0.001$ ;  $\eta^2p=0.563$ , large; Figure 3) and Yo-Yo IR2 ( $F=16.325$ ;  $p<0.001$ ;  $\eta^2p=0.505$ , large; Figure 4) test protocols. According to the analysis results, in the Yo-Yo IR1 test, the running distance achieved after the PF condition ( $2781.17\pm 542.23$  m) was significantly greater than that achieved after the VE ( $2611.76\pm 502.74$  m) and NES ( $2421.17\pm 489.77$  m) conditions ( $p<0.05$ ; Figure 3). In contrast, in the Yo-Yo IR2 test, the running distances recorded after the PF ( $1054.11\pm 280.69$  m) and VE ( $1009.41\pm 211.91$  m) conditions were significantly greater than the distance recorded after the NES ( $782.35\pm 182.46$  m) condition ( $p<0.05$ ); however, no statistically significant difference was found between the running distances achieved after the PF and VE conditions ( $p=0.346$ ;  $p>0.05$ ; Figure 4).



NES: No External Stimulus; VE: Verbal Encouragement; PF: Performance Feedback

**Figure 3.** The Effect of external motivation on running distance in the Yo-Yo IR1 test



NES: No External Stimulus; VE: Verbal Encouragement; PF: Performance Feedback

**Figure 4.** The Effect of external motivation on running distance in the Yo-Yo IR2 test

## **DISCUSSION and CONCLUSION**

This study investigated the effects of verbal encouragement (VE) and performance feedback (PF) interventions, applied as external motivation during the Yo-Yo Intermittent Recovery Tests (Levels 1 and 2), on aerobic performance in amateur football players. The main finding of the study indicated that running distances achieved during both the Yo-Yo IR1 and IR2 tests under both external motivation interventions were significantly greater than those achieved under the NES condition, where no external stimulus was provided. The higher running distances recorded under the PF and VE conditions compared to NES suggest that immediate PF and VE serve a motivating role, both psychologically and physiologically, in football players. Specifically, while PF resulted in greater performance improvements than VE during the Yo-Yo IR1 test, no statistically significant difference was observed between the two stimuli during the Yo-Yo IR2 test. This finding suggests that immediate PF may be more effective during lower-intensity tests. Furthermore, these results may be associated with the concept of self-efficacy within Bandura's social cognitive theory. In other words, PF may strengthen an individual's perception of self-efficacy, thereby enhancing effort levels and endurance (Bandura, 1997).

Conversely, the absence of a statistically significant difference between the PF and VE conditions in the Yo-Yo IR2 test (which involves higher intensity and anaerobic characteristics) suggests that verbal encouragement may be as effective as PF during high-intensity performances. This finding highlights that psychological factors may play a critical role, particularly in short-duration maximal tests where anaerobic capacity is limited. Barwood et al., (2009) reported that individuals receiving verbal encouragement were able to sustain exercise for longer durations even under thermal load (i.e., heat stress induced by environmental conditions). Similarly, McCormick et al., (2015) argued that verbal encouragement enhances endurance performance and that its motivational effects are directly reflected in performance outcomes.

The lower performance values observed in the absence of external stimuli, as seen under the NES condition, suggest that the lack of motivational elements may negatively impact physical performance. This finding aligns with the approaches grounded in Self-Determination Theory proposed by Deci and Ryan (1985). According to this theory, when individuals experience a deficiency in external motivation, their intrinsic motivation is also suppressed, resulting in decreased performance.

Performance feedback (PF) is a critical external motivation tool widely used by both coaches and researchers, providing athletes with immediate and targeted information about their current performance, thereby enabling them to correct or maintain their performance (Ward, 2011). The provision of PF can influence psychological processes, contributing not only to enhancements in athletic performance but also to increased motivation during strength and conditioning exercises (Wilson et al., 2017, 2018; Weakley et al., 2020). In a study conducted by Weakley et al., (2020), the effects of different types of feedback were examined in semi-professional rugby players, and it was concluded that verbal kinematic feedback enhanced athletic performance. Similarly, Pacholek and Zemkova (2022) found that providing PF during physical fitness tests in male students significantly improved lower and upper body explosive strength, acceleration, and running speed performance, particularly increasing power output in the bench press test. These findings demonstrate that PF plays an important role by positively

affecting not only physical outputs but also psychological factors such as attention and effort level.

The use of verbal encouragement (VE) during performance is a common practice in exercise and sports sciences and is extensively employed to enhance effort levels or sustain motivation during maximal exercise tests (Halperin et al., 2015). According to the literature, Neto et al., (2015) found that verbal encouragement had positive effects on maximal oxygen uptake, distance covered, and final heart rate in adolescents performing the 20-meter shuttle run test. Edwards et al., (2018) argued that VE improved performance in sprint and endurance exercises and also strengthened motivation to engage in exercise the following day. This represents a significant advantage in terms of both physical performance development and exercise adherence. Similarly, Selmi et al., (2023) reported that providing VE during repeated agility speed training in young football players enhanced psychophysiological responses, mood, and perceived enjoyment.

In a study conducted by Andreacci et al., (2002), it was found that providing verbal encouragement at regular intervals (every 20 or 60 seconds) during a treadmill test significantly increased participants' maximal effort levels compared to conditions where encouragement was given infrequently (every 180 seconds) or not at all. This finding suggests that consistent and rhythmic verbal support during exercise contributes to maintaining or enhancing individuals' effort levels. Similarly, in the present study, the administration of VE and PF at every 40-meter running cycle helped sustain participants' motivation throughout the test, resulting in significant improvements in aerobic performance. Delivering feedback at this frequency demonstrated alignment with the test structure and enabled participants to adjust their effort in real time. Therefore, this approach stands out as a highly applicable and effective motivational strategy in field settings. Moreover, it was reported that VE exerted beneficial effects on muscular endurance compared to conditions without VE (Bickers, 1993).

Numerous studies in the literature have reported that verbal encouragement (VE) positively influences various motor skills. Hammami et al., (2023) found that VE provided by coaches during small-sided games (SSGs) led to improvement in physical fitness test performance and technical skills among adolescent female students. Romdhani et al., (2024a) obtained that VE during SSGs improved aerobic performance in semi-professional male soccer players. In another study conducted by Romdhani et al., (2024b) found that verbal encouragement increased participants' performance in the bench press, squat, and deadlift. Similarly, Pacholek and Zemkova (2022) reported that VE provided during physical fitness tests resulted in significant enhancements in lower and upper body explosive strength, acceleration, and running speed performance in male students. Furthermore, the application of VE has been suggested to exert positive effects on maximal strength (McNair et al., 1996; Amagliani et al., 2010), rate of force development (Anzak et al., 2011; Fernandez-Del-Olmo, 2014), anaerobic performance (Karaba-Jakovljevic et al., 2007), and submaximal whole-body endurance (Andreacci et al., 2002).

The findings of the present study are generally consistent with previous research, demonstrating that both verbal encouragement (VE) and performance feedback (PF) significantly increased running distances during the Yo-Yo IR tests (Levels 1 and 2). In conclusion, this study highlights that external motivational strategies (PF and VE) are important factors in enhancing the aerobic performance of amateur football players. Based on

these findings, it can be suggested that coaches and strength and conditioning professionals could strategically implement external motivational interventions during training and testing sessions to increase athletes' effort levels and improve performance outcomes.

### **Limitations of the study and suggestion for future research**

The present study includes certain limitations that could influence the interpretation and broader applicability of its results. First, the study was conducted exclusively on young amateur male football players, which limits the generalizability of the results. Future research should aim to replicate these findings across broader age groups and among elite male and female football players. Second, aerobic performance was assessed solely through running distance. Incorporating additional physiological and perceptual measures, such as heart rate, lactate concentrations, and ratings of perceived exertion, alongside running distance would provide deeper insights into the effects of PF and VE on athletes' anaerobic performance. Furthermore, in the current study, participant playing positions were not considered during measurement. Future studies accounting for playing positions could better elucidate the impact of individual factors on athletic performance. Finally, conducting similar investigations across different sports and using various external motivational strategies would allow for a more comprehensive evaluation of the effectiveness of external motivational stimuli.

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**Conflicts of Interest:** The authors declare no conflict of interest

**Data Availability:** The datasets used and/or analyzed during our study are available from the corresponding author upon reasonable request, provided the appropriate permits are obtained from the relevant authorities.

**Authorship Contribution Statement:** Study conception and design: IC, AA, and YEA. Acquisition of data: YEA, EG. Analysis and interpretation of data: IC, YEA, and EG. Writing—review and editing: IC, YEA, EG, SK, MCK, AA, OT. Project supervision: IC. All the authors have read, revised, and approved the final version of the manuscript.

**Generative AI Disclosure:** No generative artificial intelligence tools were used in the preparation of this study. All text, analyses, and content in the manuscript were produced solely through the authors' own academic knowledge, interpretive capacity, and intellectual contribution.

### **Ethics Approval**

**Ethics Committee:** Scientific Research and Publication Ethics Committee of Iğdır University

**Date/Protocol number:** 09.12.2024 / 33

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