



# Effects of Verbal Encouragements on Selected Measures of Physical Fitness and Subjective Effort Perception in Young High School Students

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## Abstract

This study aimed to examine the effects of verbal encouragements (VE) on linear sprint speed, jump height, change of direction (CoD) speed, and subjective perception of effort among high school students. Twenty-three high school male students volunteered to participate in this study (age = 19.70 ± 1.06 years). Participants were evaluated during two separate sessions (first session with VE and second session without VE) in a randomized order. The teacher provided VE during each physical test. Jump height [squat jump (SJ), countermovement jump (CMJ), five jump test (FJT)], linear sprint speed (10-m and 30-m sprint), and CoD speed (30-m with CoD) were performed during the two sessions. The rating of perceived exertion (RPE) was recorded after each session. Results indicated that VE induced moderate but significant improvement in 10-m (ES = 0.71, P = 0.023) and 30-m (ES = 0.76, P = 0.016) sprint speed. However, the 30-m sprint with CoD did not change across conditions (P > 0.05). For jump tests, significant moderate-to-large increases were observed under the VE compared with the non-VE condition (ES = 0.65 to 0.90; P = 0.005 to 0.037). Findings showed a large increase in effort perception following VE compared to the non-VE condition (ES = 1.54, P < 0.001). In conclusion, the findings of this study indicated that VE has a positive impact on measures of physical fitness but increases effort perception.

**Keywords:** Motivation, Physical Fitness, Effort Perception, Active Student

## 1. Background

Several factors were reported to affect physical performances during testing (1). Some of these factors are related to the characteristics of tested participants (e.g., sex, somatic features) while others are predominantly related to factors such as external and internal motivation as well as environmental conditions (2). More specifically, it has been reported that verbal encouragement (VE) during maximum effort results in a positive effect on athletes' performance (2). VE is an external motivation tool that can be provided by coaches during training sessions to change movement behavior and to reach a better effort engagement, in particular during high-intensity exercises (3-6). However, there is evidence that VE could increase the subjective perception of effort [rating of perceived exertion (RPE)] (5, 7). For instance, Sahli et al. (7) studied the effects of VE on psychophysiological and affective responses during small-sided games in male school students aged 17 years. The some authors (7)

revealed significantly higher RPE values (+ 13.12%) after small-sided games under VE compared with no VE. In addition, Rampinini et al. (5) examined the effects of VE on the intensity of small-sided games in amateur soccer players aged 24 years. They showed that VE during small sided games resulted significant RPE scores (5.5 to 31.9%) compared no VE.

To authors' knowledge, limited studies have been published regarding the effect of VE on athletes's physical performance compared to high school students (2, 5). Specifically, the effects of VE on RPE in high school students are still unclear.

## 2. Objectives

This study sought to examine the effects of VE on measures of physical fitness (i.e., linear sprint speed, change of direction (CoD) speed, vertical and horizontal jumps) RPE in high school male students. With reference

to previous literature (4-7), we hypothesized that VE will positively affect measures of physical fitness and increase the RPE scores in high school male students.

### 3. Methods

#### 3.1. Participant

Twenty-three high school male students (age:  $19.70 \pm 1.06$  years; height:  $1.78 \pm 0.06$  m; body mass:  $68.95 \pm 5.97$  kg; body mass index:  $21.68 \pm 2.13$  kg.m<sup>-2</sup>) volunteered to participate in this study. All participants were regularly engaged in 3 physical education sessions per week as part of their educational curriculum. None of the participants has any kind of medical restrictions during the experimental period. Participants were asked to refrain from any strenuous exercises 48 hours before the beginning of the experimental sessions. The local research ethics committee approved this study. The experimental protocol was conducted according to the Declaration of Helsinki for human experimentation. All participants and parents of those below 18 years gave written informed consent after a detailed explanation about the aims and risks associated with this study.

#### 3.2. Procedures

Two familiarization sessions were performed one week before the start of the experimentation, all measurement was conducted at the same time of day. In a randomized counterbalanced study design, participants were evaluated in two separate sessions with 4 days in between. The first session was conducted under VE conditions while the second was carried out without VE. During the two sessions, measures of physical fitness including jumping [squat jump (SJ), countermovement jump (CMJ) and five jump test (FJT)], linear sprint speed (10-m and 30-m sprint), and CoD speed (30-m with change of direction) were conducted. The order of testing measures is displayed in Figure 1. Before each testing session, athletes were submitted to 15 min of a standardized warm-up consisting of aerobic running (intensity > 75% maximum heart rate), coordination movements, dynamic stretching, and  $4 \times 8$  m sprints. Three minutes of rest separated the warm-up from the first measure of physical fitness (7).

##### 3.2.1. Verbal Encouragement Procedure

The teacher encourages the students verbally with words such as "as fast as you can, you did well, it's great, don't give up, great, come on, you're going to get there" during each measure of physical fitness and individually for each student (8).

##### 3.2.2. Vertical Jump Tests

Vertical jumps height (CMJ and SJ) was carried out as described by Glatthorn et al. (9), using an Optojump system (Microgate, Bolzano, Italy). Each participant performed three maximal CMJs and SJs, with approximately 2 min of recovery in between. Participants were asked to jump as high as possible. The best trial was used for further analyses. Test-retest intraclass correlation coefficients (ICCs) for CMJ and SJ tests were 0.99 and 0.81 respectively.

##### 3.2.3. Five Jump Test

The FJT test is practical and valid and is often used to estimate lower limbs muscle power (10). At the beginning of the test and after the fifth jump, feet are in parallel position (10). FJT performance was recorded in meters (m) to the nearest cm. Participants performed two trials and the best trial was used for further analyses. ICC for test-retest reliability was 0.95.

##### 3.2.4. Linear Sprint Speed

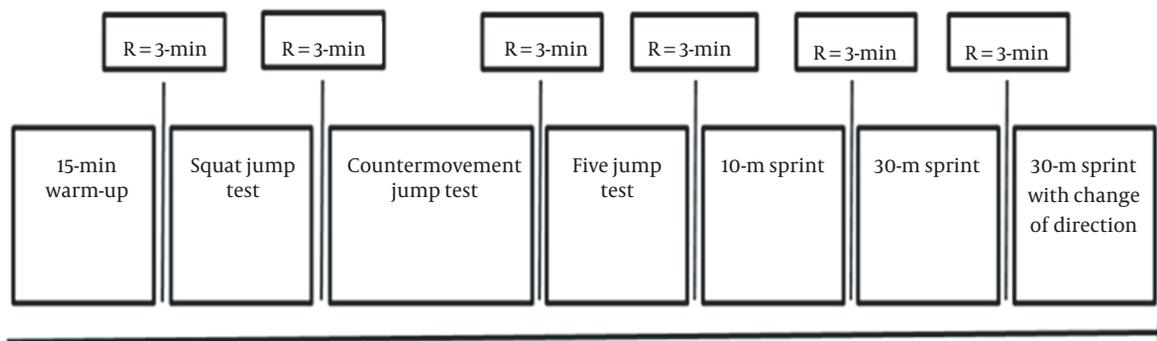
As previously described by Ouerghi et al. (11), the sprint speed performance was evaluated over a distance of 30 m with a split time at 10 m. The participant stands behind the starting line, at the signal; he begins his race at full speed over a distance of 30m, with a free-standing start. Three pairs of photocells (Brower timing system, Salt Lake City, UT, USA) are placed in a straight line at 0, 10 and 30 m to signal the passage time. The cells are placed at a height of 1 meter above the ground. Participants performed two trials, three minutes of rest were given between each trial with the best was used for statistical analyses. ICCs for test-retest reliability were 0.95 and 0.99 for 10-m and 30-m sprint, respectively.

##### 3.2.5. Change of Direction Speed

The participant is placed behind the starting line; at the signal he starts his race at full speed over a distance of 30m (15 + 15 m). The photoelectric cell (Brower timing system, Salt Lake City, UT, USA) is placed at the start. Participants performed two trials, three minutes of rest are allocated between trials and the best performance was used for further analyses. ICC for test-retest reliability was 0.99.

##### 3.2.6. Rating of Perceived Exertion

The RPE was recorded for each subject after 5-min of each session using the 10-point RPE score (12). A standardized question "How was, and how did you feel the exercise?" was used to measure the RPE. This method is a well-established to be valid and reliable to



**Figure 1.** Study design of the order of physical exercises (R, recovery time)

quantify internal load (13). Of note, all participants were familiarized with the RPE score before the experimental measures. Reliability of the test was 0.98.

### 3.3. Statistical Analyses

Data are presented as mean and standard deviation (means  $\pm$  SD). Statistical analyses were performed using SPSS version 20.0 statistical software (IBM, Armonk, NY, USA). Normality assumption was checked and confirmed using the Kolmogorov-Smirnov test. The ICC was used to calculate the reliability of the measurements between sessions (14).

One-way ANOVA was used to compare measures of physical fitness between the two sessions as well as RPE scores (i.e., under VE condition vs. without VE) Effect size (ES) was calculated using Cohen's  $d$  and classified as small ( $0.00 \leq d \leq 0.49$ ), medium ( $0.50 \leq d \leq 0.79$ ), and large ( $d \geq 0.80$ ) (15). The significance level was set a priori at  $P \leq 0.05$ .

## 4. Results

Our findings indicated significantly larger improvements in 10-m [ $P = 0.023$ ,  $ES = 0.71$  (medium)] and 30-m linear sprint speed [ $P = 0.016$ ,  $ES = 0.76$  (medium)] under VE condition compared to no VE (Table 1).

For CMJ performance, significant difference between conditions was observed ( $P = 0.005$ ,  $ES = 0.90$  (large)), with higher values following VE compared to no VE (Table 1). Similarly, a significant higher difference was noted for SJ performance following VE ( $P = 0.006$ ,  $ES = 0.87$  (large)).

In terms of FJT, results showed a significant difference between conditions [ $P = 0.037$ ,  $ES = 0.65$  (medium)] with higher values following VE (Table 1).

With regards to RPE score, significant higher difference following VE compared to no VE [ $P < 0.001$ ,  $ES = 1.54$  (large)], (Figure 2).

## 5. Discussion

This study aimed to examine the effects of VE on linear sprint speed, jump height, CoD speed, and subjective perception of effort in high school students. Findings showed that VE induced significant, moderate-to-large improvements in all measures of physical fitness except 30-m sprint with CoD and SJ. Additionally, RPE scores were significantly higher after VE compared to no VE.

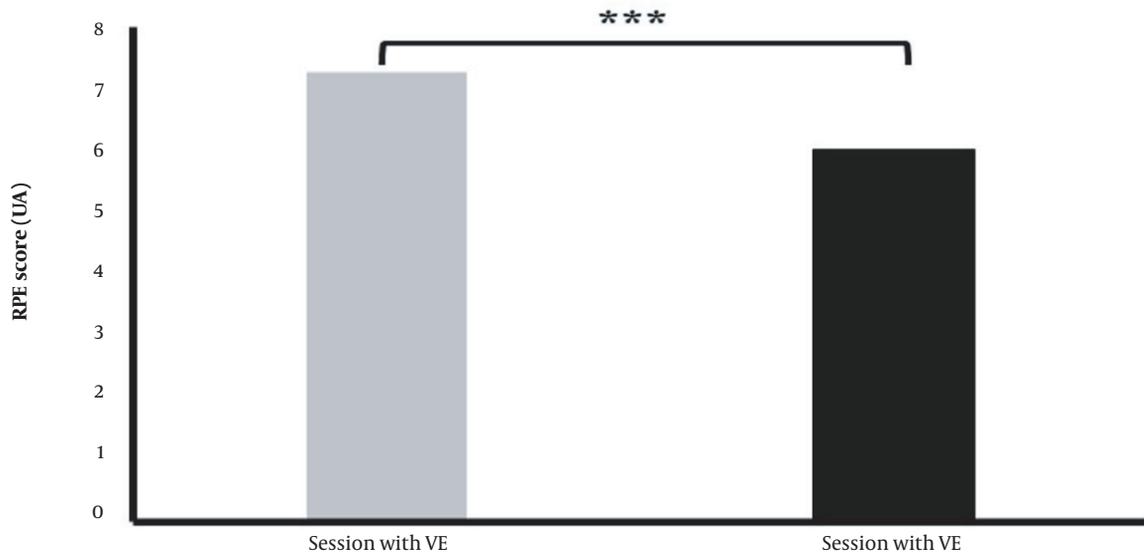
### 5.1. The Effect of Verbal Encouragement on Measures of Physical Fitness

Our results showed that jumping and linear sprint speed performances increased significantly after VE. These results are in agreement with those reported by previous studies (8, 16). Specifically, Rendos et al. (8) reported that VE resulted in an increased knee extensors and flexors strength performance among healthy adults aged 23 years compared to no VE. In the same context, Engel et al. (16) examined the variability between high-intensity functional strength days and endurance performance tests with and without VE in experienced athletes (age =  $23.7 \pm 4.3$  years). These authors showed that mean squat strength was higher and improved under the VE condition (+1.91%). For the endurance task, results showed no significant differences between VE and non-VE conditions ( $P = 0.71$ ) (16). Likewise, Edwards et al. (17) studied the effect of VE on self-paced endurance and sprint exercises in active individuals female (age =  $24 \pm 3$  years). These authors revealed greater performance for the average power in cycling with the VE. The 30-m sprint with CoD performance did not improve after VE. Improving maximum upper and lower body strength, can express this results. However, this exercise was strongly correlated with maximum lower limb strength (18).

**Table 1.** Results of Sprint and Jumping Performances (Mean  $\pm$  Standard Deviation) After Sessions with and Without Verbal Encouragement in Study Subjects (n = 23)

Variables	with VE	Without VE	95% [CI]	P-Value	ES
10-m sprint (s)	1.88 $\pm$ 0.08	1.93 $\pm$ 0.08	-0.05 [-0.10 - 0.01]	0.023	0.71 [medium]
30-m sprint (s)	4.45 $\pm$ 0.23	4.61 $\pm$ 0.22	-0.17 [-0.30 - -0.03]	0.016	0.76 [medium]
30-m with DC (s)	6.33 $\pm$ 0.30	6.49 $\pm$ 0.30	-0.16 [-0.34 - 0.01]	0.071	0.56 [medium]
SJ (cm)	11.85 $\pm$ 1.19	11.15 $\pm$ 1	0.70 [0.04 - 1.35]	0.037	0.65 [medium]
CMJ (cm)	31.41 $\pm$ 2.69	29.23 $\pm$ 2.43	2.18 [0.66 - 3.70]	0.006	0.87 [large]
FJT (cm)	33.63 $\pm$ 2.88	31.20 $\pm$ 2.66	2.44 [0.79 - 4.09]	0.005	0.90 [large]

Abbreviations: VE, verbal encouragement; DC, direction change; SJ, squat jump; CMJ, countermovement jump; FJT, five jump test; CI, confidence interval.

**Figure 2.** Results RPE score (mean  $\pm$  standard deviation) after sessions with and without verbal encouragement in study subjects (n = 23) (RPE, rating of perceived exertion; VE, verbal encouragement)

### 5.2. The Effect of Verbal Encouragement on Subjective Perception of Effort

Our results revealed that VE increase the RPE score after the VE session compared to no VE condition. These results are in line with those of Selmi et al. (2). They compared the effects of VE during small-sided games on RPE and physical enjoyment in young soccer players aged  $15.7 \pm 0.7$  years. The results showed an improvement in RPE and physical enjoyment under the VE condition only (2). In addition, Rampinini et al. (5) investigated the effect of VE in different soccer game formats (3 vs 3, 4 vs 4, 5 vs 5, and 6 vs 6) on small, medium, and large pitches in young soccer players aged 24 years. The same authors showed that VE given from the coach improve the RPE score during the soccer-reduced games.

In the other hand, a recently published study indicated that VE is beneficial in improving psychological and other physiological parameters (heart rate max, physical enjoyment) (7). However, Sahli et al. (7) showed that VE could improve the mood state during soccer small-sided games in male students. The same authors also confirmed that VE is considered as an external motivation imposed by the teacher during physical education and sports sessions in high male students. On the other hand, Sahli et al. (7) showed that VE could improve the physiological aspect by decreasing maximum heart rate in students during reduced football games.

### 5.3. Limitations

These results should be taken with some caution since the tests were carried out on a small sample size and can be

generalized when using a larger number of participants.

#### 5.4. Conclusions

The results of this study showed that VE delivered by teachers has a positive effect on measures of physical fitness but increases effort perception in high school male students. VE can be considered as an external motivation that can improve the physical performance and subsequently the RPE can be increased. Thus, it is important to consider using VE to motivate participants to achieve better performance during physical education sessions.

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#### Footnotes

**Authors' Contribution:** Conceptualization, H.S. and N.O.; Formal analysis, N.J. and M.Z.; Methodology, H.S., S.A. and F.S.; Writing-original draft, H.S., N.O. and M.H.; Writing, review and editing, M.Z., H.S. and M.H. All authors have read and agreed to the published version of the manuscript.

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**Informed Consent:** The experimental protocol was conducted according to the Declaration of Helsinki for human experimentation. All participants and parents of those below 18 years gave written informed consent after a detailed explanation about the aims and risks associated with this study.

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