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ORIGINAL RESEARCH

Small-sided-games with coaches' verbal encouragement have a positive effect on aerobic performance, mood state, satisfaction and subjective effort in male semi-professional soccer players

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Abstract

The study aimed to examine the impact of high-intensity Small-Sided Games (SSGs) with coaches' verbal encouragement (VE) on soccer players' aerobic performance, mood state, satisfaction and subjective effort. Forty-three semi-professional male soccer players were randomly assigned to three distinct groups: a control group (CG, n = 14), an experimental group with verbal encouragement (EGVE, n = 14), and an experimental group without verbal encouragement (EGNE, n = 15). Participants performed the VAMEVAL aerobic test, Total-Mood-Disorder (TMD), and the Satisfaction Scale for Athletes (SSA) tests before and following the 6-week SGGs program that included ten training sessions. Rating of Perceived Exertion (RPE) was collected 5-minutes post-training session. The SGGs program with coaches' VE showed a significant improvement in maximal aerobic velocity (MAV) and TMD scores ($p < 0.05$). Except for the SSA scores ($p = 0.268$), the percentage of change was higher for MAV ($p = 0.001$; d: 1.36–1.48 (large)) and TMD scores ($p = 0.001$; d: 1.45–1.48 (large)) in the EGVE group when compared with the other groups (*i.e.*, EGNE and CG). Overall, RPE scores were significantly higher ($p < 0.05$; d: 0.99–5.00 (large)) in the EGVE group than other groups. The present study highlights the positive effects of integrating SSGs with coaches VE to improve aerobic performance and mental well-being of semi-professional soccer players. Nevertheless, notably the SSA did not exhibit a statistically significant difference. Furthermore, the experimental EGVE group reported elevated RPE, potentially suggesting that SSGs may entail greater physical and mental challenges, yet may yield more sport-specific outcomes for soccer players.

Keywords

Aerobic fitness; Coaching; Football performance; Intermittent exercise; Motivation; Mood

1. Introduction

Soccer is a fast-paced and highly competitive sport that demands strategic positioning and movement on the field [1]. To succeed, players must possess both high levels of physical fitness and mental robustness. Achieving this requires a rigorous training regimen that includes intense physical preparation, effective communication, and verbal encouragement (VE) during both training and official matches [2]. In modern soccer, players must be able to adapt quickly to changing situations and make split-second decisions [3] and possess the endurance and strength capabilities to maintain performance throughout the entire match and season. This requires a combination of cardiovascular exercise, strength training and mental focus. In this context, the direct influence of other psychological factors, such as motivation (*i.e.*, VE), related to an enhanced capacity to engage in different achievement tasks [4] are considered mediators of the physical, technical, and tactical abilities of players, positively affecting performance [2, 4]. For instance, a positive comment in soccer such as “Good match today!” or “You did very well today in 1 *vs.* 1 defending” [5] elicit very different reactions in players. Jaffri and Saliba [6] recently showed that providing VE resulted in a greater increase in dynamic balance performance among participants with chronic ankle instability. However, to the best of the authors’ knowledge, no study has evaluated the effects of VE on sport-specific capacities in soccer.

In soccer, Small-Sided Games (SSGs) are a crucial component of training [1, 7]. These games are of utmost importance for players seeking to enhance soccer-specific skills and abilities [8]. However, it’s not solely about the technical aspects of the game. Recent research has demonstrated that play-based training can be a potent motivator for soccer players, inspiring them to push themselves to the brink and complete their exercises with zeal and vigor [2]. Previous studies [9, 10] have underestimated the effectiveness of this approach, emphasizing the significance of integrating match-play training scenarios into the global soccer training program. This strategic integration enables coaches to sustain players’ engagement, motivation, and concentration, ultimately resulting in elevated match performance levels [7, 11].

In team sport competitions, players are required to swiftly transition from one situation to another, as well as from one behavior to another. This constant change of pace and behavior creates an environment that always generates the unexpected [12]. To secure success match outcome, players must exhibit a diverse array of attributes, encompassing physical, technical, tactical, and mental proficiency [13, 14]. Recent studies showed that training programmes centered around SSGs have garnished prominence, owing to the capacity to augment players’ physical and psychological aptitudes [7, 9, 11]. These playful situations have been shown to positively impact players’ mood, physical enjoyment, well-being, and perception of effort [9, 13].

In contemporary times, it is widely acknowledged that VE from coaches or physical trainers serves as an external motivating factor that may assist players in maintaining commitment, particularly during high-intensity exercise [15, 16]. Previous studies have demonstrated that VE can have a positive effect on both physical and psycho-physiological parameters [5, 6, 10]. Aydi *et al.* [17], Selmi *et al.* [10] and Sahli *et al.* [9] collectively established that VE exerts a substantial augmentative influence on performance across various SSGs formats including; 3 *vs.* 3, 4 *vs.* 4 and 5 *vs.* 5, as well as during the Intermittent Yo-Yo test and maximal aerobic power training sessions. Notably, in further studies, it was observed that exercises accompanied by verbal coaching elicited a statistically significant elevation in heart rate variables [5, 6, 10]. Thus, the conclusions drawn from these findings may imply that coaches and trainers may employ VE as a potent instrument to instigate motivation and inspire athletic performance. Through the provision of constructive feedback and unwavering support, coaches can foster a sense of player dedication towards desired physical outcomes, thereby facilitating the attainment of key objectives [5, 6]. Such an approach holds the potential to culminate in heightened performance and overarching triumphs, benefiting not only the individual player but also contributing towards the collective success of the team.

From the existing literature, it is evident that VE may be a potentially effective method (ergogenic aid) to improve soccer-specific capacities, especially during SSGs. Considering that SSGs in soccer are a type of exercise where the repeated maximal shuttle running speed with changes of direction (CoD) is an important physical capacity [18], reports investigating the acute effects of receiving VE on both physical and psychological parameters in soccer players will be particularly beneficial. Finally, although VE have been evaluated as a method to improve training effectiveness, there is a lack of research where these two methods are simultaneously examined regarding the concurrent effectiveness in the context of soccer-specific performance. Therefore, this study aimed to explore the effectiveness of various SSGs with coaches’ VE on physical and psycho-physiological parameters such as aerobic performance, mood state, training satisfaction, and perception of effort in semi-professional male soccer players. It was hypothesized that VE can contribute to improved physical and psycho-physiological responses based on previous research [9, 13, 17].

2. Materials and methods

2.1 Study design

A longitudinal cross-sectional study design was employed, involving repeated observations over a 6-week period.

2.2 Participants

From forty-eight participants, forty-three semi-professional male soccer players (age: 24.6 ± 3.5 years, height: 181.2 ± 5.8 cm, body mass: 78.8 ± 7.7 kg and body fat percentage: 16.0 ± 1.6%) volunteered to participate in the study. Participants were randomly assigned to three sub-groups: a control group (CG, n = 14; 5 defenders, 5 midfielders and 4 attackers), and two SSGs experimental groups: verbal encouragement (EGVE, n = 14; 6 defenders, 5 midfielders and 3 attackers) and without verbal encouragement (EGNE, n = 15; 5 defenders, 6 midfielders and 4 attackers). The current study determined its minimum sample size using G-power Software 3.1.9.7 (University of Dusseldorf, Dusseldorf, Germany). A priori power analysis was conducted employing F tests based on the study design, which encompassed analysis of variance with repeated measures (ANOVA) with within-between interaction analysis. The study encompassed three groups and measurements at two time points. The significance level (α) was set at 0.05, with a minimum effect size of 0.27, a correlation of 0.5 among repeated measures, and a nonsphericity correction of 1. To attain a power (1–β error probability) of 0.80, the minimum sample size for achieving statistical significance was computed as 39 participants, yielding an actual power of 83.0%. The inclusion and exclusion criteria were established as a priori. Inclusion criteria required full training attendance for all participants in both groups. Throughout the study, all soccer players remained free from injury. Only training data from players that completed all training sessions in full, amounting to 100%, were considered for the final analysis. Exclusion criteria included the use of any dietary supplements during the study period and engagement in supplementary non-team training activities. All participants had six years of experience in soccer within a semi-professional club (second league). All participants received comprehensive information both verbally and in written form concerning the experimental protocol and the study objectives. All data were anonymised prior to analysis to ensure confidentiality. Moreover, participants were devoid of any medical conditions.

2.3 Procedures

The investigation was conducted during the pre-competitive training phase, spanning the months of August and September. Prior to the start of the experiment, players completed three initial sessions on separate days in order to collect physical characteristics (session 1), and to familiarize with the VAMEVAL aerobic test, Profile of Mood State (POMS), Satisfaction Scale for Athletes (SSA) and Rating of Perceived Exertion (RPE) scales (sessions 2 and 3). The data collection was conducted through a counter-balanced randomized research design. On the initial test day and following three days recovery days, prior to the 6-week (T1) training program (T0), all participants were administered the POMS and SSA scales. Following this, participants performed the VAMEVAL aerobic test using standard regulated VE. To ensure inter-day reliability and sensitivity of the aforementioned tests, the assessment trials were administered on two separate occasions to eight participants with a 1-week interval between each trial.

Prior to arriving at the test location, all participants were instructed to maintain regular afternoon snacks, ensure adequate hydration, and refrain from engaging in maximal exercise within the 48-hour period prior to testing. The testing sessions were organized and executed in a cyclical fashion to ensure that the trials were conducted as closely together as possible, thereby minimizing any potential circadian variations in the measurements. At both T0 and T1, the assessments for VAMEVAL, POMS and SSA were conducted between 04:00 and 06:00 PM. The study was conducted in ambient temperatures ranging between 23 °C and 31 °C and humidity between 53% and 76% with wind speed <2 m·s^{-1}. The playing areas were standardized and formatted to ensure player safety and to allow easy and accessible communication between the coach and players [19].

For every training session, players were assigned to one of the three experimental conditions: Experimental Group with Verbal Encouragement (EGVE), Experimental Group without Verbal Encouragement (EGNE), or Control Group (CG). Both the EGVE and EGNE groups incorporated SSGs as part of the training program, as outlined in Table 1. In contrast, the CG followed a training program with an equivalent volume but devoid of any SSGs. Subsequently, all participants engaged in a standardized 15-minute warm-up routine, involving submaximal running, dynamic stretching, low-intensity forward, sideways, and backward running, several acceleration runs, and progressively intensified jumping exercises. Following five minutes of dynamic stretching, all participants proceeded to complete the designated tests. To establish initial training load benchmarks, RPE were recorded five minutes following the conclusion of each testing and training session. This practice also served to discern inherent day-to-day performance variations [20].

2.4 Data collection tools

2.4.1 Aerobic endurance testing (VAMEVAL)

The VAMEVAL test was conducted on a 200 m outdoor running track, adhering to the protocol outlined by Cazorla [21]. The test commenced at a speed of 8 km·h^{-1} and escalated by 0.5 km·h^{-1} at the onset of each minute, prompted by an auditory signal, without any intervening rest intervals. The test concluded when the athlete could no longer maintain the pace or achieve the anticipated marker synchronized with the beep on three consecutive occasions. The Maximal Aerobic Velocity (MAV) achieved by the player was regarded as the primary metric derived from the test.

2.4.2 Profile of mood state test (POMS)

The POMS questionnaire was utilized to measure player mood disturbances [22]. This self-report questionnaire consists of 65 adjectives designed to assess six states (Tension-anxiety, Depression-dejection, Anger-hostility, Vigor-activity, Fatigue-inertia and Confusion-bewilderment). The responses to each item are rated on a 5-point Likert scale (0 indicates "Not at all" and 4 indicates "extremely"). The total mood disturbance (TMD) was calculated as follows: [TMD = ((Anger + Confusion + Depression + Fatigue + Tension) − Vigor) + 100]. The Cronbach's α coefficients ranged from 0.85 to 0.91, indicating high internal consistency. The questionnaire was administered to players individually.

2.4.3 Satisfaction scale for athlete (SSA)

According to the extant literature, the three most prominent dimensions of athlete satisfaction encompass satisfaction with performance [23, 24]. Thus, the SSA consists of three sub-dimensions, namely, "satisfaction with coach", "satisfaction with team performance" and "satisfaction with team-mates". The current subjective SSA scale comprises a total of 16 questions. Each item is presented with a rating scale ranging from "7 = Extremely satisfied" to "1 = Not at all satisfied", mirroring the Likert 7-type scale to gauge the perception of the athletes.

2.4.4 Rating of perceived exertion (RPE)

Internal load was recorded immediately following the SSGs using the RPE scale (Borg CR10 scale), as previously proposed [25, 26]. Each player's RPE was collected to ensure that the perceived effort only referred to the SSGs training. This method has been previously validated in soccer [27].

2.4.5 Heart rate (HR)

Heart rate (HR) was additionally monitored at 5-second intervals throughout training sessions and the VAMEVAL test, utilizing the Polar Team Sport System 2 (Polar Electro Oy, Kempele, Finland). Heart rate data during training sessions were expressed as a percentage of maximum HR (HRmax) and grouped into three training intensities: $<80\%$, 80–90% and $>90\%$ [28].

TABLE 1. Six-week periodized training intervention.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Week 1	Evaluation	Rest	Evaluation	Rest	SSGs 1	Tech + Tact	Day Off
Week 2	Tech + Tact	SSGs 2	RS	Tech + Tact	SSGs 3	Tech + Tact	Day Off
Week 3	Tech + Tact	SSGs 4	RS	Tech + Tact	SSGs 5	Tech + Tact	Day Off
Week 4	Tech + Tact	SSGs 6	RS	Tech + Tact	SSGs 7	Tech + Tact	Day Off
Week 5	Tech + Tact	SSGs 8	RS	Tech + Tact	SSGs 9	Tech + Tact	Day Off
Week 6	Tech + Tact	SSGs 10	RS	Evaluation	Rest	Evaluation	Day Off

Tech + Tact: Technical & Tactical training; RS: Recovery Session; SSGs: Small-Sided Games.

2.4.6 Verbal encouragement intervention

During the SSGs training sessions, the targeted participants received encouragement according to previously described protocols [4, 5]. Accordingly, the protocol is outlined.

The coach was positioned in close proximity and within the line of sight of the designated participant, creating an environment where the player felt enveloped and motivated by the coach. Furthermore, the coach employed VE, employing expressions such as "bravo", "champion", "well done" and "Go", to stimulate continued effort. This VE was consistently directed towards the targeted participant throughout the duration the SSGs. Additionally, the coach maintained an overall encouraging demeanor, employing authoritative and empowering language to instill confidence and reassurance in the encouraged player, even during negative outcome actions occurred.

2.4.7 SSGs intervention

Both the EGVE and EGNE groups followed a standardized microcycle consisting of five training sessions and one match per week. Notably, two of these training sessions incorporated SSGs (Table 1). The SSGs were conducted at a consistent time of day, both with and without coaches' VE on natural outdoor grass pitches. The environmental conditions featured an average temperature of 28 ± 1.5 °C and a relative humidity of $61 \pm 4.1\%$. Numerous balls were strategically positioned around the playing area to reduce wasting time. Players were not provided with any specific tactical instructions. The SSGs were played on three different sized playing areas: a medium-sized pitch, a large-sized pitch (20% bigger than the medium-sized pitch), and a small-sized pitch (20% smaller than the medium-sized pitch) [29]. The SSGs consisted of 4 *vs.* 4 with goalkeeper played on a 40×20 m pitch and 2 *vs.* 2 without a goalkeeper played on a 20×20 m pitch (surface area per player = 100 m^2) (Table 2). The reason of varying the playing area during SSGs was to assure the effectiveness of VE on physical and physiological responses during soccer SSGs [29, 30]. The duration of the SSGs increased progressively from session to session. The characteristics of the SSGs format are shown in Table 2. The CG adhered to a regimen consisting of five sessions per week over a 6-week period, devised by the coach, that excluded any SSGs.

2.5 Statistical analysis

Data analyses were performed using SPSS version 23.0 for Windows (version 23.0, IBM Corp, Armonk, NY, USA). Mean and standard deviations (SD) were calculated after verifying the normality of distributions using the Shapiro-Wilk. After, VAMEVAL, POMS and SSA data were analyzed using a mixed factorial ANOVA (group (EGVE *vs.* EGNE *vs.* CG) × time (T0 *vs.* T1)). A 3 × 10 (group × time) repeated-measures mixed factorial ANOVA was used to analyze the effect of VE and time on RPE scores over all ten training sessions. Greenhouse-Geisser corrections were used when the assumption of sphericity (Mauchly's test) was violated. To guard against type II errors, an estimation of statistical power and effect size was provided, utilizing $\acute{\omega}$ and η^2p, respectively. The Cohen scale was employed to elucidate the interpretation of "η^2p": η^2p values less than 0.06 were regarded as indicative of a small relationship, values ranging from 0.06 to less than 0.14 were categorized as moderate, and values equal to or exceeding 0.14 signified a large relationship [31]. Moreover, within-group Effect Sizes (ES) were computed using the following equation: ES = (mean post − mean pre)/SD. After confirming significant factors interactions, a Bonferroni-adjusted pairwise *post-hoc* test was performed [32]. As per the categorization established by Hopkins *et al.* [32], effect sizes (ES) were delineated into the following classifications: "trivial" (<0.2), "small" (>0.2–0.6), "moderate" (>0.6–1.2), "large" (>1.2–2) or "very large" (>2). Moreover, intersession reliability of VAMEVAL, POMS, SSA and RPE were determined. The relative reliability was determined by calculating an Intraclass Correlation Coefficient (ICC) model 3,1. The absolute reliability was expressed in terms of the Standard Error of Measurement (SEM) and Coefficients of Variation (CVs). Heteroscedasticity was also examined. Significance for all the statistical tests was accepted at $p < 0.05$.

3. Results

Data were all normally distributed (Shapiro-Wilk: $p > 0.05$). For all characteristics data (*i.e.*, age, body mass, body height, body mass index, and body fat percentage) of participants, there were no significant differences (p = 0.175–0.709; η^2p: 0.02–0.08 (medium); $\acute{\omega}$: 0.10–0.36) between groups (*i.e.*, EGVE, EGNE, CG) (Table 3).

For the reliability assessment, the pairwise analysis of MAV, SSA, TMD and RPE indices revealed no significant differences between sessions ($p > 0.05$; d: 0.03–0.18 (trivial)). The

TABLE 2. Characteristics of the SSGs training sessions.

Session	Variant	Playing area	Progressive overload	Total duration of the game	Recovery between bouts*
SSGs 1	2 *vs.* 2	20 × 20 m	5 × 3 min.	15 min.	2 min.
SSGs 2	4 *vs.* 4 + GK	40 × 20 m	5 × 4 min.	20 min.	2 min.
SSGs 3	2 *vs.* 2	20 × 20 m	7 × 3 min.	21 min.	2 min.
SSGs 4	4 *vs.* 4 + GK	40 × 20 m	6 × 4 min.	24 min.	2 min.
SSGs 5	2 *vs.* 2	20 × 20 m	9 × 3 min.	27 min.	2 min.
SSGs 6	4 *vs.* 4 + GK	40 × 20 m	7 × 4 min.	28 min.	2 min.
SSGs 7	2 *vs.* 2	20 × 20 m	10 × 3 min.	30 min.	2 min.
SSGs 8	4 *vs.* 4 + GK	40 × 20 m	8 × 4 min.	32 min.	2 min.
SSGs 9	2 *vs.* 2	20 × 20 m	11 × 3 min.	33 min.	2 min.
SSGs 10	4 *vs.* 4 + GK	40 × 20 m	9 × 4 min.	36 min.	2 min.

*GK: Goalkeepers; SSGs: Small-Sided Games; *: passive recovery.*

TABLE 3. Mean (±SD) data measured for the age and anthropometric data.

	EGVE (n = 14)	EGNE (n = 15)	CG (n = 14)	Main Effect
Age (yr)	23.36 ± 2.17	24.73 ± 2.25	24.50 ± 1.70	$p = 0.175$ $\eta^2p = 0.08$ ώ = 0.36
Body mass (kg)	75.59 ± 11.22	71.07 ± 6.89	75.43 ± 7.59	$p = 0.293$ $\eta^2p = 0.06$ ώ = 0.26
Height (cm)	175.57 ± 6.98	174.13 ± 5.42	175.64 ± 3.73	$p = 0.709$ $\eta^2p = 0.02$ ώ = 0.10
BMI (kg/m^2)	24.47 ± 2.83	23.47 ± 2.40	24.43 ± 2.03	$p = 0.460$ $\eta^2p = 0.04$ ώ = 0.18
BFP (%)	15.75 ± 3.95	14.57 ± 3.43	15.87 ± 2.86	$p = 0.533$ $\eta^2p = 0.03$ ώ = 0.15

BMI: Body Mass Index; BFP: Body Fat percentage; CG: Control Group; EGVE: Experimental Group with VE; EGNE: Experimental Group without VE; η^2p: Effect size; ώ: Statistical power.

MAV test showed a "good" absolute and relative inter-session reliability (ICC (3,1) = 0.89; SEM = 2.17% and CV = 6.53%). Moreover, SSA, TMD and RPE scores displayed a "moderate" (ICC (3,1): 0.64–0.74) relative reliability with excellent absolute reliability (CV: 1.49–1.56% and SEM: 0.81–89%). In contrast, RPE scores showed "poor" absolute reliability (SEM *p* 5.09% > 5% and CV = 11.2% > 10%). Moreover, it was observed that there was no heteroscedasticity in the raw data (*r*: 0.04–0.19; *p*: 0.47–0.63) (Table 4).

For MAV and TMD tests, it was found that there was a significant effect of time ($p < 0.001$; $\eta^2p = 0.46$ (large), ώ = 1.00), and time × group effect ($p < 0.001$; η^2p: 0.33–0.35 (large); ώ: 0.98–0.99). Bonferroni-adjusted comparisons revealed that the MAV and TMD scores were significantly changed (higher for MAV and lower for TMD) after the training program (T1, $p < 0.05$), only in EGVE group (Table 5). In the SSA test, a highly significant main effect of time was observed ($p < 0.001$; $\eta^2p = 0.69$ (large), ώ = 1.00), but no significant time × group effect detected ($p = 0.265$) (Table 5).

Apart from the SSA scores ($p = 0.268$), the one-way ANOVA analysis unveiled significant differences in both the percentage of changes in MAV performance and TMD tests ($p < 0.001$). Tukey *post-hoc* comparisons (Fig. 1) showed a higher percentage change in MAV performance ($p = 0.001$; d: 1.36–1.48 (large)) and TMD scores ($p = 0.001$; d: 1.45–1.48 (large)) in the EGVE group when compared with other groups (*i.e.*, EGNE and CG).

During the experimental training sessions, the one-way ANOVA analysis of RPE scores revealed the existence of significant differences between groups ($p <$ 0.001–0.008; η^2p: 0.22–0.85 (large); ώ: 0.82–1.00). The Tukey *post-hoc* comparisons showed that the EGVE had significantly higher RPE scores ($p < 0.05$; d: 0.99–5.00 (large)) compared to other groups over all training sessions (Fig. 2).

TABLE 4. Inter-session relative and absolute reliability of MAV, POMS, SSA and RPE variables (n = 8).

Variables	Mean ± SD		$ICC_{3,1}$ (95% CI)	CV %	SEM (%)
	Session 1	Session 2			
MAV ($km \cdot h^{-1}$)	14.63 ± 2.10	14.88 ± 2.01	0.89 (0.55–0.98)	6.53	0.32 (2.17)
SSA (AU)	96.63 ± 1.51	97.00 ± 1.51	0.67 (−0.66–0.93)	1.56	0.87 (0.89)
TMD (AU)	119.00 ± 2.33	119.50 ± 1.20	0.70 (−0.49–0.94)	1.49	0.97 (0.81)
RPE (AU)	7.50 ± 1.07	7.38 ± 0.74	0.74 (−0.29–0.95)	11.22	0.42 (5.70)

Data for trials 1 and 2 are presented as mean ± SD; AU: Arbitrary Units; ICC: Intra-Class Correlation Coefficient model 3,1; CV: Coefficient of Variation; MAV: Maximal Aerobic Velocity; POMS: Profile of Mood States; RPE: Rating of Perceived Exertion; SEM: Standard Error of Measurement; SSA: Satisfaction Scale for Athlete; TMD: Total Mood Disorder Score; SD: standard deviation; CI: Confidence Interval.

TABLE 5. Effects of VE and SSGs training program on MAV, POMS and SSA indices.

	EGVE (n = 14)	EGNE (n = 15)	CG (n = 14)	Mains Effects		Interactions
				Group	Time	Group × Time
MAV ($km \cdot h^{-1}$)						
T0	14.14 ± 1.86†	14.60 ± 2.04	14.96 ± 2.32	$p = 0.925$ $\eta^2p = 0.01$ ώ = 0.06	$p < 0.001$ $\eta^2p = 0.46$ ώ = 1.00	$p < 0.001$ $\eta^2p = 0.33$ ώ = 0.98
T1	15.96 ± 2.46	15.03 ± 2.45	15.32 ± 2.88			
SSA (AU)						
T0	96.43 ± 1.22†	96.73 ± 1.71†	97.00 ± 2.08†	$p = 0.941$ $\eta^2p = 0.01$ ώ = 0.06	$p < 0.001$ $\eta^2p = 0.69$ ώ = 1.00	$p = 0.265$ $\eta^2p = 0.06$ ώ = 0.28
T1	99.00 ± 1.11	98.67 ± 1.23	98.71 ± 1.49			
TMD (AU)						
T0	116.50 ± 2.14†	117.07 ± 2.87	117.21 ± 2.97	$p = 0.025$ $\eta^2p = 0.17$ ώ = 0.69	$p < 0.001$ $\eta^2p = 0.46$ ώ = 1.00	$p < 0.001$ $\eta^2p = 0.35$ ώ = 0.99
T1	112.57 ± 2.82	116.20 ± 2.46	116.50 ± 2.24			

AU: Arbitrary Units; EGVE: Experimental Group with Verbal Encouragement; EGNE: Experimental Group without Verbal Encouragement; CG: Control Group; MAV: Maximal Aerobic Velocity; POMS: Profile of Mood States; SSA: Satisfaction Scale for Athlete; SSGs: Small-Sided Games; TMD: Total Mood Disorder Score; T0: Before training; T1: After training; η^2p: Effect size; ώ: Statistical power. †: Significant differences from before (T0) and following (T1) experimental period, at $p < 0.001$.

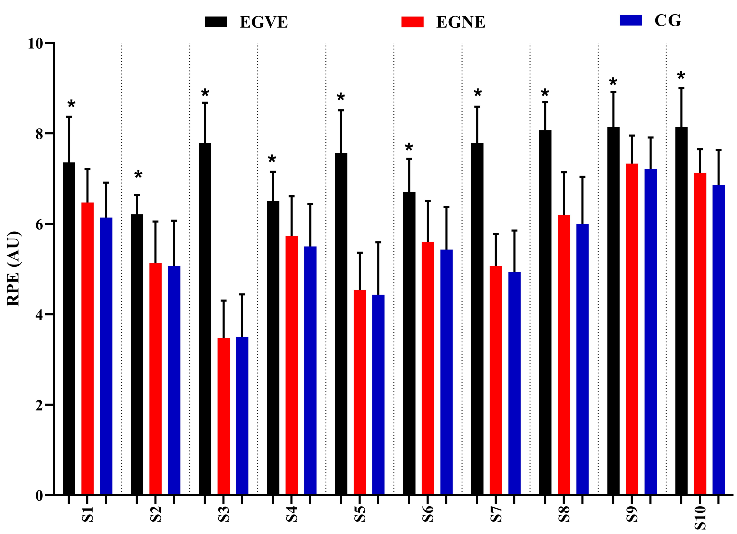

FIGURE 1. Training (*e.g.*, SSGs and VE) associated changes in MAV, SSA and TMD. EGVE: Experimental Group with Verbal Encouragement; EGNE: Experimental Group without Verbal Encouragement; CG: Control Group; MAV: Maximal Aerobic Velocity; SSA: Satisfaction Scale for Athlete; SSGs: Small-Sided Games; TMD: Total Mood Disorder score; RPE: Rating of Perceived Exertion; AU: Arbitrary Units. *: Significantly different from from other groups at $p < 0.001$.

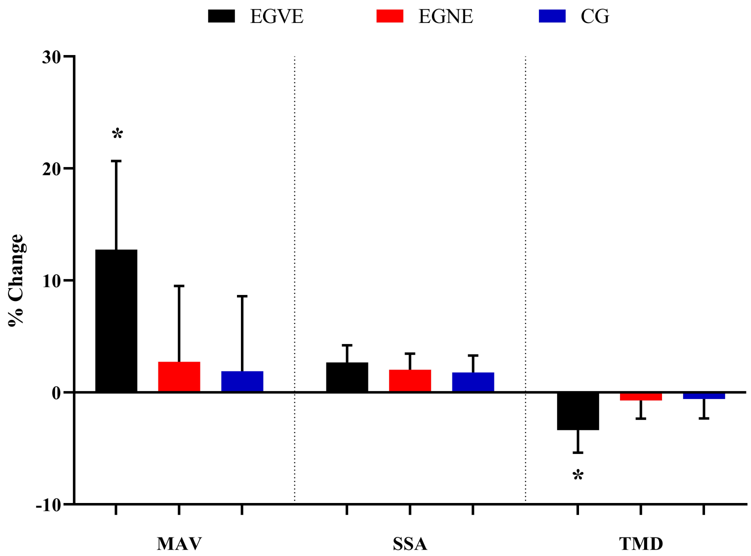

FIGURE 2. Effects of VE and SSGs training on session RPE. EGVE: Experimental Group with Verbal Encouragement; EGNE: Experimental Group without Verbal Encouragement; CG: Control Group; RPE: Rating of Perceived Exertion; SSGs: Small-Sided Games; MAV: Maximal Aerobic Velocity; SSA: Satisfaction Scale for Athlete; TMD: Total Mood Disorder Score; S1 to S10, *: Significantly different from from other groups at $p < 0.001$.

4. Discussion

The purpose of this study was to investigate the effectiveness of a training program that utilizes SSGs in combination with VE from coaches. The main results indicated that a 6-week SSGs training program coupled with VE from coaches significantly enhances the MAV and POMS in soccer players. However, the SSA variable was only significantly impacted by time, regardless of the type of intervention (*i.e.*, SSGs and VE). Additionally, EGVE reported significantly higher RPE scores than other groups throughout all training sessions. Ultimately, in alignment with the current study hypothesis, the incorporation of VE can indeed result in superior physical and psychophysiological responses.

The findings of the present study have revealed a significant difference in MAV performance among the three examined groups. The present results showed that the EGVE group, that received VE during ten SSG sessions, and featured a progressive and periodized training regimen ranging from 5 sets of 3-minutes to 9 sets of 4-minutes, interspersed with 2-minutes of passive rest, exhibited the most substantial enhancement in the MAV variable. It is worth noting that both experimental groups (EGVE and EGNE) trained under the same conditions and at the same time of day. Nonetheless, the EGVE group received additional support from both the coach and physical trainer throughout the ten training sessions, incorporating virtual elements, whereas the EGNE group trained without any virtual enhancements. Therefore, EGVE showed higher MAV values post-training program. This represents an impressive improvement of 1.82 km·h^{-1}. On the contrary, the EGNE group experienced only a marginal rise in MAV, and this increase did not reach statistical significance. The contrast between the two groups was remarkable, the EGVE group demonstrated a notable advancement margin of 12.8%, a figure notably higher than that observed in the other two groups. Following this, it has been discovered that VE can exert a positive influence on physical performance during a lactic-based SSGs training program comprising of ten sessions at an intensity approximating maximum aerobic power (W/R: 3/2).These findings are consistent with previous studies conducted by Hoff *et al.* [33] and Selmi *et al.* [13], that also demonstrated that VE from coaches improved physical performance measured by the POMS scores (Tension, Depression, Anger, Vigor, Fatigue and Confusion), HR measures, RPE and blood lactate concentration values (La) during training programs. Additionally, Ouertatani *et al.* [34] found that high-intensity intermittent training with VE had positive effects on muscular power of the lower body, MAS performance, modified agility *t*-test, and mood scores in young soccer players.

During the experimental training sessions, the RPE scores indicated significant differences between groups. Specifically, EGVE demonstrated significantly higher scores than the other groups across all ten training sessions (Fig. 2). These results suggest that VE can have a significant impact on performance during training sessions. These findings have important implications for coaches and trainers who may be able to improve athlete performance by providing verbal support and motivation. For instance, Selmi *et al.* [10] explored the impact of VE from coaches during 4 *vs.* 4 SSGs on physiological responses, and revealed that professional soccer players experienced higher RPE scores and percentage of HRmax (%HRmax) during SSGs with VE compared to those without VE. These findings have significant implications for coaches and players, as the same authors suggested that VE can be a powerful tool in optimizing performance and motivating players to maximize potential and achieve heightened levels of success.

The results of the POMS test showed that the TMD score was significantly affected by time, with a significant interaction between time and group. Upon conducting pairwise comparisons, it was found that the TMD scores were significantly decreased following the training program (at T1), but only in the EGVE group (Table 5). In addition, the percentage of change analysis revealed significant differences in TMD scores between groups. Additionally, the EGVE group had a higher percentage of change in TMD scores when compared to the other groups. In simpler terms, the present study found that the training program had a positive impact on the mood disorder scores of soccer players, particularly in the EGVE group. Regarding this, a recent study showed that VE has the potential to enhance the mood state of soccer players during SSGs training [17]. This implies that coaches and team-mates who offer constructive feedback and motivational support have the potential to exert a positive influence on the emotional well-being of fellow players. Through the cultivation of a nurturing and encouraging atmosphere, players are inclined to experience heightened motivation and engagement, consequently resulting in enhanced match performance. Therefore, incorporating VE into training sessions may be a valuable tool for coaches and players alike.

The present findings align with previous research that has explored the relationship between exercise type and mood across various sporting disciplines [35, 36]. In fact, a previous study demonstrated that athletic high-intensity training programs can lead to mood disturbances, reduced energy levels, and decreased commitment [37]. As a result, athletes participating in a high-intensity athletic training programs (*i.e.*, CG in this study) may experience negative emotions, unlike those who engaged in the SSGs [9]. Another study indicated that CG individuals may have lower TMD scores due to a lack of physical motivation, while the SSA may be associated with negative psychological responses [38].

Conversely, players who participated in the SSGs with VE may be motivated by the technical and tactical aspects of the game, that may help to maintain positive moods [12, 39]. This suggests that the presence of the ball and encouragement during SSGs may play a key role in maintaining athletes' mood. The emotional reactions to training play a crucial role in achieving optimal performance [40]. Previous studies utilizing the SSA have examined satisfaction as a key factor in determining the effectiveness of training sessions, as well as motivation [41, 42], participation, and engagement [43]. Furthermore, levels of satisfaction and mood, as well as the extent of focus and engagement, can significantly influence adherence to training [44]. Therefore, it is important to consider the affective responses of individuals when designing and implementing training programs. By doing so, coaches and practitioners can create a more positive and productive learning environment, leading to better outcomes for all involved.

The current study demonstrated that SSA scores exhibited a statistically significant increase across all participant groups subsequent to the implementation of a training program. Previous studies have demonstrated a persistent and favorable correlation between SSA scores and the psychological state [9, 41]. The EGVE and CG showed fundamental differences that had a strong influence on satisfaction. The use of the ball and the presence of opponents effectively recreated the competitive atmosphere typically associated with soccer competition. As a result, these differences may be associated with the improved performances and the high level of satisfaction observed with the SSGs with coach VE [45].

The present study is not without its limitations. One pertained to the fluctuating environmental conditions experienced during the intervention period [46, 47]. As a result, different results may be found in different phases of the season. To make better generalizations, future studies should analyze a longer period. Another limitation could be the familiarization with the tests applied that were performed in the beginning of the study [48–50]. In this case a learning effect may occur and influence the present results. This suggests that certain players experienced more pronounced enhancements in both physical and psychological performance due to VE. Lastly, the third limitation may be the omission of player positions. However, it is important to note that this research was conducted within an experimental design. In future studies, similar research could be replicated with a larger sample size, while also considering player positions, in order to further investigate the effects of SSGs on both physical and cognitive performance characteristics. Consequently, the incorporation of VE should be a consistent practice. Subsequent studies should also consider individual responses to VE. Such investigations will ultimately elucidate the underlying mechanisms of VE-related effects on observed performances, including individual player responses, and thereby ensure the appropriate customization of training for soccer players, particularly in the use of SSGs. Given the direct relevance of SSGs to competitive soccer outcomes, it is imperative that these findings be integrated into routine soccer training programs to enhance competitive success.

5. Conclusions

To summarize, the current study confirms the efficacy of integrating SSGs with coaches VE in augmenting both aerobic performance and psychological well-being of semi-professional soccer players. Nevertheless, it is crucial to acknowledge that the athletes' satisfaction scale remained unaffected by these interventions. Furthermore, the experimental EGVE group reported elevated RPE, potentially suggesting that SSGs may entail greater physical and mental challenges, yet may yield more sport-specific outcomes for soccer players.

AVAILABILITY OF DATA AND MATERIALS

Data are available for research purposes upon reasonable request to the corresponding author.

AUTHOR CONTRIBUTIONS

ZR, MZ and RH—designed the research study. RH, HIC and FS—wrote the manuscript. WD, PTN and NS— performed the research. MZ, HIC and RO—analyzed the data. All authors contributed to editorial changes in the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was reviewed and approved by the Scientific and Ethical Committee of High Institute of Sports and Physical Education of Kef (Code 2022-0079, 12 April 2022). Written informed consent to participate in this study was provided by the participant's legal guardian/next of kin. Informed consent was obtained from all individual participants included in the study.

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CONFLICT OF INTEREST

The authors declare no conflict of interest. Pantelis T Nikolaidis and Rafael Oliveira are serving as the Editorial Board members of this journal. We declare that Pantelis Nikolaidis and Rafael Oliveira had no involvement in the peer review of this article and have no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to DM.

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