



Self-talk and Goal-setting Combination Enhancing Performance of Perceptual Motor Skill

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Article Info	Abstract
Article type: Original Article Article history: Received: 29 May 2025 Revised: 12 July 2025 Accepted: 03 August 2025 Published online: 01 January 2026 © 2026 the authors. Published by University of Tehran, Faculty of Sport Sciences and Health. This is an open access article under the terms of the Attribution-NonCommercial 4.0 International (CC BY 4.0) License.	Background: Self-talk and goal setting facilitate learning sports skills and athletes' performance; however, the practical use of these strategies, especially in combination, remains limited. Aim: The aim of this study was to determine the effect of the combination of self-talk and goal-setting on the acquisition and retention of badminton long serve skill. Materials and Methods: The study included 48 female high school students (15 to 18 years old) who were accessibly selected. Based on pre-test scores, participants were homogenized into 4 groups of 12, including an instructional self-talk group, performance goal-setting group, combined group, and control group. The training protocol was performed for 4 sessions, every other day, and 30 trials in each session. After the training sessions, a post-test was conducted, and 24 hours later, a retention test was conducted. To compare the performance of the groups at different stages of the study (pre-test, post-test, retention test), using the Scott and Fox Long Serve Test, one-way ANOVA and A mixed ANOVA with repeated measures based on training sessions were used. Results: Findings show that in the acquisition phase, all groups had significant progress during the acquisition phase, while the progress of the groups was different from each other so that the combined group from the second session onwards the control group, and the self-talk group also showed significant progress compared to the control group in the third and fourth sessions. Also, the performance of the groups in the retention stage showed that only the combined group performed significantly better than the control group and the difference between the other groups was not significant. Conclusion: The results support the effectiveness of self-talk and goal-setting combination in the learning of badminton long serve skill. Therefore, coaches recommended to use this interactive method. Keywords: Goal-setting, Self-talk, Acquisition, Retention, Badminton serve.

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1. Introduction

Motor learning is defined as processes involved in the acquisition of motor skills and the variables which enhance or inhibit the acquisition of motor skills (1). It is considered one of the manifestations of behavior and important principles in human life that is meant to result in appropriate methods for better and more efficient education. Variables such as training style and type of instruction play influential roles in acquiring motor skills.

Sports coaches and physical education teachers have always been seeking ways to facilitate the acquisition of sports skills and help athletes reach their athletic peak performance (2). One of these strategies is instruction, which increases performance level of sports skills. Historically, researchers believed that the main factor related to physical performance is physical exercise. However, now psychological factors are also known to enhance performance (3).

Research in sports psychology has so far pertained to intervention techniques that improve performance in athletes (4, 5) which leads to performance development (6). Some of these psychological techniques include self-talk, goal setting, mental imagery and relaxation that exert a huge impact on learning and performance (7). Self-talk and goal setting are psychological skills that facilitate learning sports skills, psychological preparation and athletes' performance. Self-talk involves repeating planned words, positively or negatively, to guide or motivate actions (8).

Instructional self-talk encompasses words about accuracy, attention, technical information, tactical choices that are announced by the individual. The self-efficacy instruction increases performance through stimulating desirable functions and attention. Motivational self-talk, on the other hand, includes words about the self-confidence structure, effort amount, moods, and positive mental states that one repeats to oneself. The motivational function of self-talk is to boost confidence, effort, and regulate arousal and anxiety (8, 9).

As far as human behavior study is concerned, Bandura's cognitive-social theory (1986) expressed an interactive model among behaviors, individual and environmental factors that reflect the interaction between cognition, emotions and physiological status. This approach, greatly influenced by motivation, asserts that the interaction of thoughts and emotions strengthens and regulates a person's behavior to achieve his/her goals (10, 11).

Although evidence-based literature concludes both instructional and motivational self-talk are effective in improving performance (8, 12-19), instructional self-talk seems to act more effectively than motivational self-talk in accuracy-driven tasks (19-22). Some research has also shown that instructional self-talk is more effective in the early stages of learning (6, 21).

On the other hand, goal setting implies tasks which are performed in a systematic and categorized way to achieve the desired goal (23). However, most people set general and vague

mental goals which is not considered goal setting. Hence, goal setting is the process of setting specific goals for the future that make up motivational basis, specifies the effort required, and provides signs for resulting achievement. Thus, in sports settings, the goal is to achieve a certain standard of skill in a task within a pre-planned time frame. Motor behavior literature identifies three types of goal setting, including achievement or outcome goals (a focus on match results and interpersonal comparisons), performance goals (achieving a specific standard of performance independently of others), and process goals (focusing on the performer's behaviors and actions during a technique performance) (23-25).

Kolovelonis et al. (2012) investigated the effects of goal-setting and self-talk combination on self-regulation of students' motor skills learning and concluded that students in combination self-talk groups with process and performance goals performed better at throwing darts compared to solely goal-setting groups; Therefore, their findings revealed that psychological skills such as self-talk and goal setting might exert a positive effect on athletes' performance (8). According to the existing literature, researchers have drawn attention to the fact that it is better to apply a combination of those afore-mentioned skills for greater effectiveness of psychological skills. Greenspan and Feltz (1989) reported that three combinations of the afore-mentioned skills were superior compared with five studies that regarded separate types of intervention (26). Papaioannou

et al. (2004) examined the combined effect of goal setting and self-talk, tested professional and semi-professional soccer players from four different teams on a soccer-shooting task. Their findings showed no significant differences in performance among experimental groups, except in Session 2, when the combined group scored significantly better than the goal-setting group. They stated that whereas both goal setting and self-talk are effective in enhancing performance, some advantage may be derived from a combined intervention (18).

Given the different theories, contradictory literature and little research on the combination of cognitive strategies, it seems that further clarification is required in this regard. On the one hand, some theories such as Zimmerman's social learning theory believe that combining cognitive strategies can facilitate learning (27). On the other hand, theories such as the challenge point framework that link cognitive challenges inherent in practicing a skill to available learning potential assert that a combination of approaches may be beyond the processing capacity of the individual and undermine his / her performance (28). In order to further investigate this issue, the present study was developed to answer the following question: whether instructional self-talk, goal-setting, performance goals and their combined intervention might have a different effect on learning badminton long serve skill.

2. Methods and Materials

2.1. Participation

The statistical population included female secondary school students in the 11th district, Tehran who were enrolled in the badminton courses. Participants were female due to accessibility, cultural considerations, and to reduce variability by focusing on one gender. The final study sample included 48 healthy, right-handed students (15 - 18 years old) who had no previous badminton training and were beginners in terms of skill level. Inclusion criteria included, physical health, right-handedness, no prior experience in badminton, and full participation willingness. Exclusion criteria included, any injury or medical condition affecting motor performance, and absence from training sessions. The study Samples were selected through convenient sampling and were assigned to four groups of 12 individuals including instructional self-talk ($n = 12$), performance goal-setting group ($n = 12$), combination group ($n = 12$) and control group ($n = 12$). It should be noted that all of those individuals initially participated in the badminton long serve skill pre-test and then were homogeneously matched and assigned to the study groups based on the pre-test scores.

2.2. Instrument

2.2.1. Demographic survey questionnaire

The questionnaire was administered to obtain personal information such as age, height, weight, dominant hand, consent and authorization to

participate in a research study and physical health information as well as no specific mobility problems and impairments history.

2.2.2. Scott and Fox Long Serve Test

The purpose of the Scott and Fox Long Serve Test is to measure the ability to perform long serve to the end of the opponent's court (29). In this test, a fully stretched and strong rope with a height of 2 meters and 40 centimeters from the ground with a distance of four meters and 20 centimeters from the net is installed. Circles are drawn obliquely or in strips in the far corners of the court with a radius of 55, 75, 95, 115 cm from the point of intersection of the longitudinal and transverse line of the single court. To perform the test, the participant is placed in the diameter of the court opposite to the circles and tries to send the ball with a long serve from the rope to the circles at the bottom of the court. The scoring method is such that each circle has a certain score and the ball that lands inside the smallest circle is awarded 5 points and the other circles are awarded points 4, 3, 2 and 1, respectively. Based on the landing of the serve hit on each of the designated areas, the score corresponding to that area recorded for the participants. However, the balls that land outside the permitted rectangle are awarded zero points. Additionally, the ball that lands on the lines of the circles gets the point of the smaller circle (more points) and the score of the individual is the average of the points gained from the serves performed across the pre-test, acquisition, post-test, and retention phases,

during which the number of serves varied. The scorer (examiner) must be in a position to observe the ball passing through the rope and landing on the circles. It should be said that Balls that do not cross the rope will not score, though. Reliability and validity coefficients for the test reported 0.70 and 0.54, respectively (29).

2.3. Procedure

To carry out the research procedure, participants provided informed consent after the study details were explained. Based on inclusion and exclusion criteria, they completed a demographic questionnaire covering age, gender, height, weight, dominant hand, education, and lifestyle. A personal health questionnaire identified any conditions or injuries affecting performance. Once completed, participants proceeded with motor learning tasks. All met the study requirements and engaged in the following steps: The Introductory instruction: Participants received an overview of the research purpose, the significance of the long badminton serve, and oral guidance on serve technique, racket grip, player position, and performance. Each participant practiced the serve 5 trials, correctly holding the racket in the serving area.

Pre-test and group assignment: Immediately after instruction, participants performed 10 uninterrupted long badminton serves without feedback. Each attempt was scored using Scott and Fox's criteria, and the average score (0–5 points) was recorded as the pre-test score. Based on these scores, 48 participants were ranked and

assigned to four groups (12 each) using the ABB method. Given the nature of the data and the method of group allocation, the data were considered independent across groups. Moreover, One-way ANOVA confirmed group homogeneity at the study's start.

Acquisition Phase: In the acquisition phase, the participants in each group participated in four instruction sessions every other day for four days according to the set schedule. In each session, every participant performed three blocks of ten badminton long serve trials and all the points of the performed serves were calculated and recorded based on the instructions of Scott and Fox long serve test. Therefore, the average scores of the three blocks performed in each instruction session were compared and analyzed as the scores of the session. Participants in each of the four groups experienced different conditions, which are described below:

Instructional Self-Talk Group: the participants murmured a certain phrase (hand back movement, follow-through) in a loud voice that can be heard by the tester during all the trials of the acquisition stage and before each serve performance.

Performance Goal-Setting Group: For each participant, a specific performance goal was set beforehand and was announced as a score that the performer should strive to achieve in that pre-determined session. The goal was set as a 10% improvement over the previous score. For example, if the score in the previous session was

60, they should have tried to reach a score of 66 in the session.

Combination Group: The participants benefited from both instructional self-talk and performance goal setting; That is, before each instruction session, a performance goal was set for each individual who was expected to gain 10% more points than the previous session. Also, the participants repeated the instruction self-talk phrase (hand movement, back movement before each attempt).

Control group: Like the other participants in each instruction session, the participants performed three blocks of ten trials, but no specific performance goal was set for them and no instructional self-talk was taken for granted.

Post-test Phase: As soon as the last instruction training session in the acquisition stage ended, the students participated in the post-test immediately. At this stage, participants were asked to perform ten trials of long badminton serve skills as the pre-test stage and the average score of which was considered as a post-test.

Retention Test Phase: All students participated in a retention test 24 hours after the last instruction session, which included performing a ten-attempt block of long badminton serve with no goal-setting and self-talk. The mean scores of ten trials were recorded and analyzed as scores of the retention stage, accordingly.

2.4. Statistic

As for the descriptive statistics, measures of central tendency and dispersion were applied. Also, Excel software was utilized to draw the graphs. Shapiro-Wilk test was used to check the normality of data distribution and Levene's test was used to check the homogeneity of variances. In addition, the mixed analysis of variance test in a 4 (groups) $\times$ 4 (practice sessions) design, was used to examine the acquisition stage. Additionally, the one-way analysis of variance test was applied to examine the retention stage. All statistical analyzes were performed using SPSS 22 (P value of 0.05).

3. Results

Participants (N = 48) were female secondary school students. The mean and standard deviation of participants' anthropometric indices for each group are presented in Table 1. The mean of age, height and weight of the four groups were compared to each other. The results of one-way analysis of variance test did not show any significant difference among the groups, so it can be concluded that the four groups are homogenous in terms of anthropometric characteristics.

Table 1. Anthropometric characteristics of the participants.

Variable	Self-talk	Goal-setting	Combined	Control	ANOVA
Age (year)	16.5 $\pm$ 1.24	16.83 $\pm$.94	17 $\pm$ 1.04	16.9 $\pm$.99	F _{3,44} =.511, Sig=.676
Height	159 $\pm$ 4.7	158.41 $\pm$ 3.32	158.67 $\pm$ 3.98	160.25 $\pm$ 3.79	F _{3,44} =.501, Sig=.684
Weight (kg)	50.33 $\pm$ 6.53	48.67 $\pm$ 3.94	51 $\pm$ 3.95	51.58 $\pm$ 4.89	F _{3,44} =.781, Sig=.511

To examine acquisition, a mixed ANOVA with repeated measures (4 groups $\times$ 4 sessions) was used. Assumptions were confirmed via Box's M and Mauchly's tests. As shown in Table 2, significant main effects and interaction rejected the null hypothesis, confirming differences in acquisition. Due to significant interaction, main effects were not further analyzed; instead, four one-way ANOVAs with Tukey post hoc tests (α

= .0125) examined group differences per session. No significant differences appeared in session one, but sessions two (sig = .009, $F_{3,44}=4.326$), session three (sig = .001, $F_{3,44}=7.312$), and session four (sig = .001, $F_{3,44}=9.169$) showed significant differences. In session two, only the combination and control groups differed, while in sessions three and four, self-talk and combination groups outperformed the control.

Table 2. Mixed ANOVA with repeated measures on the training sessions in the acquisition stage

Source	Sum of Squares	df	Mean Square	F	Sig.	η^2
Session	8.534	1.915	4.457	127.76**	.001	.744
Group	3.168	3	1.056	4.067*	.012	.217
Session* group	.873	5.744	.152	4.355**	.001	.229

* Significant at level $p \leq .05$

** Significant at level $p \leq .001$

Using four repeated measures tests and Bonferroni post hoc tests ($\alpha = 0.0125$), group mean scores were compared across sessions. In the combination group, due to Mauchly's sphericity violation, Greenhouse-Geisser correction was applied. Significant improvements in long badminton serve performance appeared in self-talk (sig = .001, $F_{3,44}=52.31$), goal-setting (sig = .001, $F_{3,44}=23.98$), combination (sig = .001, $F_{3,44}=40.902$), and control (sig = .001, $F_{3,44}=19.361$) groups. Pairwise comparisons showed consistent gains in self-talk and goal-setting groups, except between sessions three and four. In the combination group, only sessions two and three showed no significant difference; other sessions improved. In the control group, no difference appeared between sessions one and two, but later sessions showed gains.

Paired t-tests showed significant improvements in long badminton serve from pre- to post-test across all groups: self-talk ($t = -11.799$, $p = .001$, MD = -0.917), goal-setting ($t = -16.793$, $p = .001$, MD = -0.758), combined ($t = -11.948$, $p = .001$, MD = 0.958), and control ($t = -8.1$, $p = .001$, MD = 0.650), indicating significant effects of the training methods in improving participants' performance.

A mixed two-way Group $\times$ Test (pre vs post) ANOVA with repeated measures showed a main effect for Test ($F_{1,46} = 514.64$, $p < .001$), but not for Group. A significant Group $\times$ Test interaction was found ($F_{3,44} = 3.89$, $p = .02$). Tukey post hoc tests showed self-talk and combined groups outperformed goal-setting and control groups in the post-test, with no other significant differences ($p > .05$). Pairwise comparisons confirmed

significant pre- to post-test improvements in all groups ($p < .001$).

Table 3. One-Way ANOVA Results for Comparing Group Performance in the Retention Test.

Source	Sum of Squares	df	Mean Square	F	Sig.
Group	.459	3	.153	4.078*	.012
Error	1.651	44	.038		
Total	2.11	47			

* Significant at level $p \leq .05$

A one-way ANOVA was used to evaluate the performance of the groups in the retention test. The results presented in Table 3, showed a significant difference between the groups ($F_{44,3}=4.078$, $\text{sig} = .012$), leading to the rejection of the null hypothesis. The Tukey post hoc test revealed that only the combined group performed significantly better than the control group in the

retention test ($\text{sig} = 0.019$). No significant differences were found between the other groups. These results indicate the positive impact of the combined method on retention performance. Figure 1 shows the layout and scoring method used in the long serve test across different stages of the study.

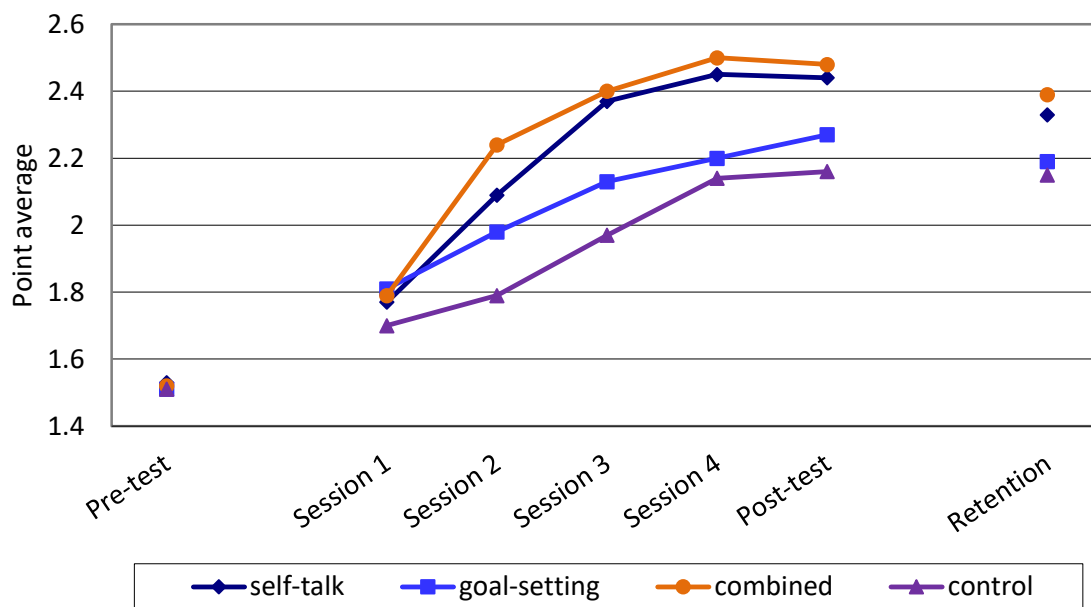


Figure 1. Mean performance scores in different phases of measuring research groups.

4. Discussion

The purpose of this study was to investigate the effect of instructional self-talk, performance goal-setting and their combination on the acquisition and retention of long serve badminton

skill. Findings show that all participants of the groups have made significant improvement in performing long badminton serve skills in all stages of learning, i.e. continuous practice with and without psychological factors (self-talk, goal

setting) promotes effective learning and performance.

Based on the acquisition phase analysis, it was revealed that the performance of the self-talk and combined groups was significantly better than that of the goal-setting and control groups. This finding suggests that employing instructional self-talk, either alone or in combination with goal-setting, leads to a more rapid improvement in motor skills during the early stages of learning. The present results are consistent with the findings of Tahmasbi Boroojeni et al. (2010), Heydari et al. (2018), Papaioannou et al. (2004), Kolovelonis et al. (2011), Miles and Neil (2013), Chang et al. (2014), Bin Dali and Parnabas (2018), Walter et al. (2019), Latinjak et al. (2019), who emphasized the positive effects of verbal instructions and instructional self-talk on motor skill enhancement (8, 12-19).

This finding is also aligned with Fitts and Posner's (1967) stages of learning theory, which states that during the cognitive stage of learning, performers demonstrate better outcomes by understanding instructions and forming associations between verbal cues and motor responses (23). Additionally, according to Nideffer's (1976) attentional focus model, the use of self-talk phrases helps direct attention to task-relevant cues, thereby improving motor performance (30).

Using a combination of psychological strategies also helps to learn motor skills and facilitates learning, and also enhances performance. In this regard, however, our results are not fully

consistent with those of Papaioannou et al. (2004), who found that the specific goals (goal setting) improves overall performance and its combination with instructional self-talk effectively improves performance (18).

From a theoretical perspective, the superior effectiveness of the combined group can be explained by the strategy synergy model, meaning that combining instructional self-talk with goal-setting simultaneously activates both cognitive and motivational self-regulatory processes, creating a synergistic effect that enhances performance during the acquisition phase (27, 31). In the present study, it appears that instructional self-talk played a central role in guiding learners cognitively and, by reinforcing verbal encoding, provided a solid foundation for improved performance in the acquisition phase. Furthermore, its combination with goal-setting may have enhanced focus and execution quality by increasing self-efficacy and clarifying performance goals.

Nonetheless, the results of the study in the acquisition stage are not consistent with the findings of previous research such as Sabounchi and Sanatkaran (2015) due to differences in the type of self-talk, Dana et al. (2016) because of differences in the frequency of self-talk, Afsanepurak and Vaez Mousavi (2017) due to differences in the type of self-talk and skill complexity, Hatami et al. (2018) because of motivational self-talk, Parsafar and Hosseini (2019) due to different tasks and Chroni et al. (2007) due to different types of self-talk (32-37).

Therefore, these differences may arise from the specific characteristics of the study samples, the type and complexity of tasks, and the various self-talk methods employed in different studies. Specifically, in some of these studies, motivational self-talk or self-talk related to more complex skills may have different effects on performance and learning.

According to researchers such as Burton's (1989), it can be said that goal setting, as a motivational strategy, increases the level of arousal and anxiety. Consequently, an increase in arousal in tasks that require high precision may lead to increased anxiety and decreased self-esteem, which in turn can reduce performance and delay learning improvement. Therefore, this explanation may be related to the poorer performance of the goal-setting group compared to the two experimental groups, as increased anxiety may reduce the effectiveness of the goal-setting strategy in this context (38).

In this study, the results of the retention phase revealed a significant improvement in the combined group compared to the control group, while no significant differences were observed between the other groups. These findings are consistent with some previous studies that have confirmed the positive effects of combining self-talk and goal-setting on the performance and retention of perceptual-motor skills (32). Specifically, the use of self-talk as a cognitive strategy to enhance focus, and goal-setting as a tool for establishing clear and measurable objectives, may contribute to better retention of

skills over time. On the other hand, these results contrast with other studies that found no significant difference between groups using self-talk or goal-setting alone, suggesting that these strategies, when applied independently, might not have the same impact on retention. Two explanations can be offered for these differences: First, theoretical explanation suggests that the combination of self-talk and goal-setting may simultaneously enhance both cognitive and physical aspects of skill acquisition, leading to improved retention, while the use of either strategy alone may not support the comprehensive development of retention over time. Second, the researcher's analytical explanation posits that neither self-talk nor goal-setting alone fully covers all aspects of motor skill learning and retention. However, when combined, these strategies might work synergistically to produce a more substantial impact on both acquisition and retention. Therefore, these findings can guide the design of training programs that integrate various psychological strategies to enhance skill learning and retention.

The main limitations of this study include the sampling method, potential differences in individual participants' abilities (despite all being beginners), the selection of only female participants, which may limit the generalizability of the results, and the lack of control checks to ensure participants' commitment to the set goals. These limitations may have an impact on the accuracy of the results. Future research should

address these limitations by using larger sample sizes, longer durations, and better control over the execution conditions. Furthermore, to expand the results, it is suggested that future studies examine the impact of combining different types of self-talk (instructional and motivational) with various goal-setting approaches (performance, process, and outcome-based).

5. Conclusion

In conclusion, the results of the study indicated that the combination of self-talk and goal-setting can have a positive and significant impact on the acquisition and retention of Badminton long serve skill. While all groups showed improvements in different stages of learning, the combined group, utilizing both self-talk and goal-setting strategies, performed significantly better than the other groups in the retention stage. These findings emphasize that using this combination of methods can be particularly effective in improving the long-term retention of perceptual-motor skills such as the long badminton serve. Therefore, it is recommended that educational programs leverage this combination of strategies to optimize learning and performance in students or learners of motor skills. Accordingly, it is suggested that coaches and physical education teachers utilize structured self-talk and goal-setting strategies—particularly in combination—when teaching motor skills, in order to enhance learning effectiveness and skill retention in learners.

Conflict of interest

The authors declared no conflicts of interest.

Authors' contributions

All authors contributed to the original idea, study design. Data collection was performed by the third author, statistical analysis and interpretation of results were conducted by the second author, who also provided statistical consultation. The manuscript was written by the first and second authors, and both reviewed and evaluated the manuscript for scientific content.

Ethical considerations

The authors have completely considered ethical issues, including, data fabrication, misconduct, and/or falsification, double publication and /or redundancy, submission, etc. and ethical issues was carried out in accordance with the Declaration of Helsinki.

Data availability

The dataset generated and analyzed during the current study is available from the corresponding author on reasonable request.

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