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Original Article

The Effects of Inner Speech on Sports Performance among Adolescents

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Abstract

Introduction: Self-talk in sports is one of the most fundamental skills of sports psychology and has an impact on movement performance.
Objective: Due to the importance of inner speech in sport, in the present study we aimed to examine the effects of inner speech on sports performance (i.e., Basketball skills) in adolescents .
Methods: This study used a descriptive correlational method. The participants included 158 adolescents (59 girls) aged 14 to 17 years in Tehran in 2023, who completed the modified LISS and performed three basketball skills (shoot, pass, dribble). Regression analysis and structural equation modelling using Smart-PLS were utilized to examine the predictive validity of the revised-LISS for basketball performance .
Results: Regression analysis and structural equation modelling using Smart-PLS were used to examine the predictive validity of the inner speech for sports performance by connecting the dimensions of the LISS (e.g., self-criticism, self-reinforcement, self-management, and social assessment) to the outcome scores in Basketball skills. The results showed that the self-reinforcement and self-management dimensions significantly affected Basketball performances .
Conclusion: The results of this study provide primary evidence that the inner speech benefit sports performance.

Keywords: Inner Speech, Sports Performance, Self-Talk, Basketball

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1. Introduction

It has been shown that specific cognitive strategies can promote performance of sports skills (1,2). One of the most common strategies used for enhancing sport performance is self-talk. Self-talk refers to words or sentences addressed to the self, said either aloud (private speech) or silently (inner speech) (4). In the sports context, self-talk can be phrased positively or negatively, have an instructional or motivational purpose, and be strategic or goal-directed (3-10). Numerous studies have examined the effects of self-talk on sports performance such as darts, wrestling, golf, and tennis (11-17). In a meta-analysis, Hatzigeorgiadis et al. (18) found that instructional self-talk (e.g., "center … goal") is more beneficial for performing closed sports skills such as throwing a dart or shooting a basketball, while motivational self-talk (e.g., "let's go") is more beneficial for performing in open sports skills such as cycling or cross country running). The current understanding of speech-performance associations in tennis matches is also hindered by the use of statistical analyses that do not account for speech and performance events being nested within both points and individuals over time throughout a tennis match. The current research uses a new, more complex, multi-level, analytical framework that enhances our understanding of speech-performance relations on the court (11,12,15,17). Research proposes that self-talk affects information processing and attention (i.e., a cognitive mechanism), self-efficacy and effort (i.e., a motivational mechanism), emotion regulation (i.e., an affective mechanism), and movement pattern and effortless performance (i.e., a behavioral mechanism) (7).

Intrapersonal communications can occur in several ways such as self-talk and inner speech. Research on self-talk dates back to the 1880s when psychologists began exploring the nature and purpose of inner speech and individuals' internal dialogues. Self-talk (internal speech) consists of four dimensions, being Positive inner speech, Negative inner speech, Educational inner speech, and Motivational inner speech. While the effects of self-talk on sports performance have been widely studied, the effects of inner speech on sports performance have received less attention. Theory and research in this area highlights the self-regulatory functions of inner speech (19-21). Inner speech has been studied mainly in the academic setting. In this regard, evidence shows that inner speech improves the academic performance (22-24). However, the academic environment is different from sports setting, because sports skills rely mainly on the motor and cognitive abilities of performers, while academic skills are mainly cognitive in nature (25). Due to the importance of inner speech in sport (6,7,9), it is

necessary to examine its effects on sport performance. Hence, in the present study, we aimed to examine the effects of inner speech on sports performance (i.e., Basketball skills) in adolescents.

2. Methods

This study used a descriptive correlational method.

2.1. Participants

The participants included 158 adolescents (59 girls) aged 14 to 17 years from middle and high schools of Tehran in 2023. The participants included individuals who had enrolled in a basketball club for at least two months. Parents gave written informed consent to take part.

2.2. Measurements

2.2.1. Specific Inner Speech Scale (LISS)

In the present study, we modified the Learning-Specific Inner Speech Scale (LISS) (22) for the sports context. The LISS has mainly used for measuring the inner speech in academic setting. The LISS contains 16 items (scored on a 5-point Likert scale from 1 = never to 5 = very often) and measures four dimensions of inner speech (e.g., self-criticism, self-reinforcement, self-management, and social assessment). Each dimension has four questions that begin with the phrase "I talk to myself silently when…". To modify the LISS for the sports context, we reworded the items for each item based on a variety of sport-related studies (26-28). For example, a revised item of self-criticism dimension is "I should have done differently in performing a sport skill". In the present study, Cronbach's alpha results show that all dimension of the revised-LISS are above the acceptable value of 0.70 .

2.2.2. *Basketball skills*

In this study, we used three valid and reliable basketball skills (i.e., shooting, passing, and dribbling), which are widely used in self-talk studies (3,13). Participants performed all tests individually in the absence of other participations. The scores were recorded by an experienced coach on personal scorecards. The skill tests are described in the following paragraphs

1) Shoot: We used a three-minute shooting test, which was previously utilized by (29,30). In this test, the participant shoots a basketball for 90 seconds from a certain distance from the hoop (radius of 366 cm) and one point is awarded for each successful throw. Cronbach's alpha for this test has been previously reported at 0.91 (29,30).

2) Pass: To evaluate pass performance, we utilized the Stubbs' Ball Handling Test (29). In this test, three circles with a radius of 30 cm and a distance of 160 cm from each other are drawn on a wall. The height of the circles is different from the ground, so that the first circle is drawn at a height of 151 cm from the ground, the second circle is drawn at a height of 121 cm and finally the third circle is drawn at a height of 136 cm from the ground. In this test, the participant was asked to stand behind a line drawn on the ground at a distance of 4.5 meters from the wall and then throw the ball towards the first circle using a chest pass and after receiving the ball, throw it towards the second and then the third circle. The participant had to do this for 30 seconds and one point is awarded for each throw that landed on the line or inside circle. Cronbach's alpha for this test has been previously reported at 0.74 (29).

3) Dribble: The dribbling part of the Harrison Basketball Battery (29) was utilized for assessing dribbling skill. In this test, the participant was asked to pass through cones while dribbling a basketball for 30 seconds. One point was awarded for each successful dribble. Cronbach's alpha for this test has been previously reported at 0.95 (29) .

2.3. Data Collection

First, the subjects participated in an familiarization session and got acquainted with the research objectives. In this meeting, parents and subjects completed the consent form. Then, the subjects completed the research questionnaire and subsequently performed the basketball skills. Any subject who did not want to complete the research process or could not complete the basketball skills during the research was excluded from the research.

2.4. Data Analysis

Regression analysis and structural equation modelling using Smart-PLS were utilized to examine the predictive validity of the revised-LISS for basketball performance by linking the dimensions of the revised-LISS to the outcome scores. In the prediction models, the latent factors were the revised-LISS dimensions and basketball skills' scores were observed variables.

3. Results

First of all, descriptive data including mean and standard deviation of basketball skills are demonstrated in Table 1.

Table 1. Mean and Standard Deviation of Basketball Skills.

Adolescents (N=158)	Mean	SD
Shoot	6.93	3.67
Pass	5.97	1.81
Dribble	7.23	3.42

The results showed that self-reinforcement and self-management had significant effects on basketball performance, r = 0.21, t = 2.94, p = 0.005 and r = 0.33, t = 3.58, p = 0.000, respectively. The effects of the other two dimensions on basketball performance were not significant (self-criticism: r = 0.05, t = 0.64, p = 0.459; social-assessment: r = 0.02, t = 0.28, p = 0.681). Figure 1 illustrates the prediction model from self-reinforcement and self-management inner speech to basketball performance. These results support the predictive validity of the revised-LISS, by indicating that two subscales predicted basketball performance in theoretically meaningful ways. Finally, Table 2 shows the fit statistics of the four prediction models, indicating that both models have good fit.

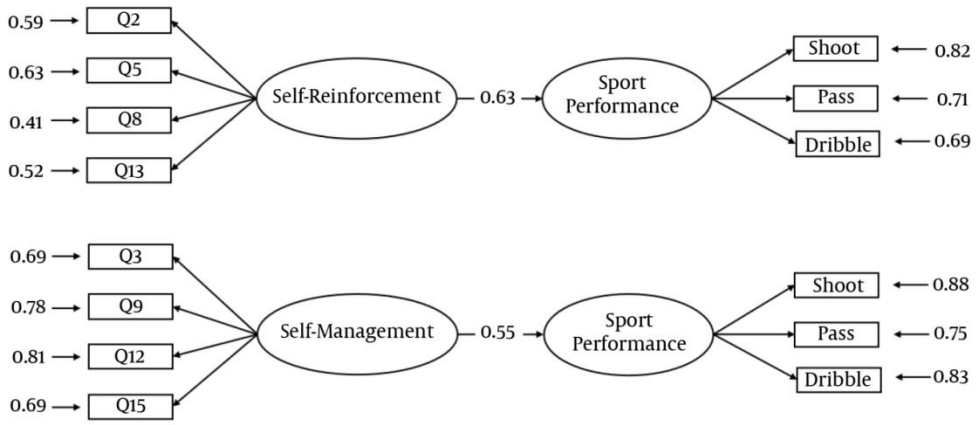

Figure 1. The Prediction Models.

Table 2. Fit Results of the Predictive Models for the Adolescents.

Adolescents (N=158)	X^2	df	RMSEA	CFI	IFI	NNFI	SRMR
Model 1 (Self-Criticism)	13.22	13	0.080	0.99	1.02	1.05	0.056
Model 2 (Self-Reinforcement)	10.61	13	0.071	0.98	1.00	1.03	0.029
Model 3 (Self-Management)	9.46	13	0.063	0.98	1.01	1.03	0.028
Model 4 (Social Assessment)	11.28	13	0.006	0.99	1.03	1.06	0.060

Notes. df=Degree of Freedom; RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index, IFI = Incremental Fit Index; NNFI = Non-normed Fit Index; SRMR = standardized root means square residual.

4. Discussion

In this study, we examined whether the inner speech affects sports performance. Overall, we found that self-reinforcing and self-managing dimensions of the inner speech significantly predicted basketball performance. The self-reinforcement result is not surprising since individuals can use this kind of inner speech to increase their motivation (16,31). In addition, self-reinforcing inner speech might increase the person's self-efficacy. These results can perhaps be explained with the concept of self-efficacy (32), because success in performance can lead to enhanced self-confidence of the performer. In addition, Bandura (32) pointed out that verbal encouragement, which can appear in the form of inner speech, may be a source of self-efficacy. Self-efficacy is one of the important components affecting sport performance (33). Regarding self-talk, it has been demonstrated that motivational self-talk increases self-efficacy and sport performance (12,34). The self-reinforcement dimension of inner speech can also be compared to motivational self-talk. In motivational self-talk, a person uses self-talk to reinforce and increase his/her motivation (such as "you can make a basket") for performing a sports skill (14,16,29,31). Hence, the self-reinforcement dimension of inner speech is likely to increase one's motivation and self-efficacy, which consequently leads to better sports performance and learning. Future studies should explore the effects of self-reinforcing inner speech on motivation and self-efficacy in the process of sport performance .

In addition, self-management is an important element of the cognitive regulatory function of inner speech (23), and in this regard, it has been demonstrated that self-management is strongly associated with cognitive performance (35), showing the capability of inner speech in predicting sports performance. The self-management dimension of inner speech can also be compared to instructional self-talk. Research has shown that the instructional self-talk (such as while shooting a free throw in basketball, athletes might tell themselves that "the location of the ball is in front and above my forehead") leads to cognitive-behavioral regulation for performing a sports skill (15,35). Athletes use instructional self-talk to direct their attention, control anxiety, judge their performance, and through these conversations provide an opportunity to express feelings, verbalize perceptions, and regulate and change their thinking in order to facilitate and improve their performance (14,29). Hence, the self-management dimension of inner speech is likely to increase one's cognitive and behavioral regulation, which consequently leads to better performance. Future studies should likewise explore the effects of self-managing inner speech on motivation and self-efficacy in the sports performance .

A limitation to this study was that we used only adolescents as statistical sample. Future studies may include children into the sample to calculate age differences regarding the effects of inner speech in motor performance. As a strength of this study, it can be stated that inner speech was used for predicting effects of inner speech on sport performance .

4.1. Conclusion

The present study revealed that self-reinforcement and self-management dimensions of the inner speech significantly affect sports performance (i.e., basketball skills). Future studies should explore the possible mechanisms underlying the effects of self-reinforcement and self-management dimensions on sports performance. Possible factors important to the sports performance context may include motivation, self-efficacy, and cognitive-behavioral regulation.

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Footnotes

Authors' Contribution: Study concept and design: B. T; D. A. Acquisition of data: D. A. Analysis and interpretation of data: D. A; GH. S. Drafting of the manuscript: D. A; GH. S. Critical revision of the manuscript for important intellectual content: B. T. Statistical analysis: GH. S. Administrative, technical, and material support: B. T. Study supervision: B. T.

Conflict of Interests: The researchers confirms that there is no conflict of interests in this study with any participant.

Data Availability: The data that support the findings of this study are openly available upon request from the corresponding author.

Ethical Approval: Approval for this study was obtained from the university. The authors confirms that all steps and requirements of this study comply with ethical guidelines. Participants were informed about the characteristics of the study and gave written informed consent.

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