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The Effectiveness of Neuro-Linguistic Programming (NLP) on Shooters' Mental Skills and Shooting Performance

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Abstract

Background: Regarding to the importance of positive effectiveness of psychological interventions on promoting mental skills and improving the performance and the important role of mental factors in improving athletes' optimal performance, NLP techniques with claims of magical powers should not be overlooked. However, a few studies have been conducted to investigate the effectiveness of unique NLP evidenced-based practices on mental skills and performance in the sports fields, especially shooting.
Objectives: This study aimed to investigate the effectiveness of neuro-linguistic programming (NLP) techniques on shooters' mental skills and their shooting performance.
Methods: This quantitative study is a semi-empirical research with the pretest-posttest design. The participants were 24 male Iranian skilled shooters in 10-meter air rifle discipline with an average age of 24 $\pm$ 8 years. They were matched and divided into control and experimental groups. While the experimental group participated in 8, 2.5-hour sessions to receive NLP techniques, the control group did their routine activities. Before and after the intervention, shooters' mental skills were measured by Ottawa Mental Skills Assessment Tool (OMSAT-3) and their performance in 2 different "ordinary" and "under pressure" conditions was measured based on the score recording rules of the Islamic Republic of Iran Shooting Sports Federation (IRISSF). Data were analyzed using a two-way (time $\times$ group) repeated measure MANOVA.
Results: The results of this study showed that NLP techniques improve shooters' mental skills and their performance in both ordinary and under pressure conditions of the competition.
Conclusions: As there is a positive significant of the effectiveness of NLP on shooters' mental skills and their performance, NLP techniques are suggested to be used to improve these two factors.

Keywords: Athletic Performance, Mental Skills, Neuro-Linguistic Programming (NLP), Rifle, Shoot

1. Background

Shooting is one of the modern medal-maker sports disciplines in international competitions. Skilled shooters' highest score is very near to the peak of winning the gold medal and a smallest difference between the champions' shooting scores will change their fate. Reaching the high competitive levels in a sport such as shooting requires physical, technical, and mental capabilities (1). However, the important point is that each of these capabilities contributes to the successful performance in sports depending on the type of the sports discipline. For instance, while physical readiness is the primary condition for succeeding in the sports disciplines such as weight lifting (2), mental readiness is of the greatest importance to shooters (3).

Mental skills are related to human adaptive behaviors and under equal conditions of technique and physical readiness, they lead to champions' shooting performance improvement (4). These skills separate elite athletes from non-elite ones (5).

It can be said that reaching to high levels in a sports discipline such as shooting is very difficult (6) because, during a shooting competition, the shooter is engaged in practicing and mastering his skills and dealing with different mental pressures and he should also be capable of keeping his concentration for a long time. Under equal conditions of technique and physical readiness, the victory can for sure be achieved only by a person who can deal with the existing mental problems in the best possible way during the relatively long period of time of the competition (7).

Regarding its nature, shooting is different compared to most of the sports activities because the shooter has no

information about the shooting performance of his rivals during the competition and he does not know his scoring difference compared to them either. He also does not know how much effort needs to overcome his rivals. Moreover, the shooter has to supervise and control his own skills, step-by-step (8, 9). This issue has highlighted the importance of recognizing this sports discipline.

Various studies have so far dealt with the effectiveness of psychological interventions on promoting mental skills and improving the performance. Their results showed that these interventions have had positive intervening effects on mental skills and performance in general (10). One of these interventions with unfortunately few evidence to be used in the sports fields is neuro-linguistic programming (NLP) (11).

NLP, a methodology to understand and change human behavior-patterns, was created by Richard Bandler, an American author and trainer in the field of self-improvement, and John Grinder, an American linguist, author, management consultant, trainer and speaker in the 1970s (12, 13). It is defined as the study of the structure of our subjective experiences and the art of communication and personal excellence (14). Its focus is on how individuals organize their feelings, thinking, and language in order to achieve their outstanding results (15).

NLP is a revolutionary approach in developing human and personal relations emphasizing three different concepts of neurology, linguistics, and planning. Mental resources (the neurotic section) are used by utilizing NLP techniques; having access to the goals is facilitated using the verbal element (verbal or lingual section); and restraining mental conditions and organizing beliefs and values shall be accomplished for getting access to desired results (planning) (16). In short, it can be argued that NLP describes the fundamental dynamics between mind (brain and nerves) and language (speech) and how they mutually affect our bodies and behavior (programming).

The theoretical infrastructures of NLP are based on the viewpoints provided in the field of relational therapy, cybernetics, hypnotherapy, and Geshtalt therapy (17).

Unique NLP evidenced-based practices, with claims of magical powers, are poorly supported by the research evidence and used to create a commercial model (18). They are mainly used in training (12, 13, 19), business and management (20), management of depression, fear, social anxiety, and behavioral disorders (11, 21, 22), occupational performance (23), changing thinking styles and beliefs (12, 24), sales management, arts, advertising, politics, instructions, organizational consultations, and generally aspects that are related to the resources of thoughts and human behaviors (25). Additionally, the positive effects of this psychological intervention on the mentioned variables have been also considered. Hence, regarding that no scientific study has been conducted so far on the effectiveness of NLP techniques on people's thinking methods and changing beliefs (12) and considering the exclusivity of shooting and the importance of cognition in this sports discipline, this study conducted a research on the effectiveness of NLP training on shooters' mental skills and their shooting performance.

2. Objectives

Since NLP resolves many problems either directly or indirectly in a short period of time and increases the athletes' performance (13), the present study aimed to investigate the effectiveness of neuro-linguistic programming (NLP) techniques on shooters' mental skills and their shooting performance in both ordinary and under pressure conditions of the competition.

3. Materials and Methods

3.1. Participants

The participants of this study were 24 male Iranian skilled shooters, members of Isfahan Shooting Board, in 10-meter air rifle discipline with an average age of 24 $\pm$ 8 years. They had participated in the country's championship air rifle shooting competitions. They were selected using convenient sampling method and matched and divided into control and experimental groups regarding to their age and shooting experiences. Prior to commencing this study, the purpose of the study and the privacy issues were explained to the participants and written informed consent was obtained from them. Furthermore, no money was taken from the participants to participate in this research.

3.2. Measurement Instruments

Ottawa Mental Skill Assessment Tool-3 (OMSAT-3) for measuring shooters' mental skills and the Islamic Republic of Iran Shooting Sports Federation (IRISSF) rules for assessing their performance in ordinary and under pressure conditions were used.

3.2.1. Ottawa Mental Skill Assessment Tool-3 (OMSAT-3)

In order to measure a broad range of mental skills, Durand-bush and Salmela developed the Ottawa Mental Skill Assessment Tool-3 (OMSAT-3) with a high level of reliability value between 0.58 and 0.64. Internal consistency scores ranged from 0.68 to 0.88 in their past research while intraclass reliability scores ranged from 0.78 to 0.96, indicating strong reliability (26).

In his research on 333 athletes, Sanati Monfared (2006) recorded the validity value between 0.68 to 0.88 and the reliability value of 0.78 and 0.96 for the Persian version of Ottawa Mental Skill Assessment Tool-3 (OMSAT-3) (27).

The third version of OMSAT includes 48 items assessing 12 mental skills groups under three main conceptual components: foundation skills (goal-setting, self-confidence, commitment), psychosomatic skills (stress reaction, fear control, relaxation, activation), and cognitive skills (imagery, mental practice, focusing, refocusing, competition planning). A 7-point Likert scale is used and each item of this tool is answered on a "strongly agree" to "strongly disagree".

3.2.2. Shooting Performance Measurement Scale

According to the Islamic Republic of Iran Shooting Sports Federation (IRISSF) rules, a complete form of 60 shots to the target in the required electronic scoring system is used. The target divided into 10 rings is placed 10 meters far from the shooter's stand. The maximum score of 10 for each shot and the maximum total score of 600 is considered within a total of one hour and 15 minutes. Before starting the score recording process, the shooters are given 15 minutes to be prepared and analyze their shooting conditions and their rifle. The first three shots are considered for evaluating the primary analysis (considering the safety and practical conditions of their weapon). These shots have no score reports.

3.3. Educational Protocol

According to the Table 1, this NLP educational protocol was designed in consultation with some NLP trainers and shooters' coaches, due to the research participants' needs, and also inspiring the previous studies using NLP techniques separately (12, 28, 29), and then taught by a professional NLP trainer in eight 2.5-hour sessions to the participants of the experimental group.

3.4. Data Collection Procedure

The participants of this study were 24 male Iranian skilled shooters in 10-meter air rifle discipline. They were matched and divided into control and experimental groups. While the experimental group participated in 8, 2.5-hour sessions to receive NLP techniques theoretically and practically based on the above-mentioned predefined protocol, the control group did their routine activities. Before and after teaching NLP techniques by a professional NLP trainer, shooters' mental skills were measured by Ottawa Mental Skills Assessment Tool (OMSAT-3) and their performance in 2 different "ordinary" and "under pressure" conditions was measured based on the score recording rules of the Islamic Republic of Iran Shooting Sports Federation (IRISSF) in the hall of Isfahan Shooting Board.

It should be mentioned that although in an ordinary condition a time period of 1 minute and 25 seconds was considered for each shot, this time was reduced to 1 minute for the under pressure condition, the shooters were filmed, and they competed at the presence of the air rifle shooting manager of the Islamic Republic of Iran Shooting Sports Federation (IRISSF) and spectators.

3.5. Statistical Analysis

In this research, first, the obtained results from the variables were described using descriptive statistical method. Differences in the characteristics of the participants assigned to the two groups were assessed using *t*-tests for independent samples for the continuous variables and the Fisher's exact test and chi-square test for the categorical variables.

Due to the multiple outcome measures in this study, analyses were performed in a two-step procedure in order to avoid loss of power due to multiple testing and to reduce the likelihood of a type I error. Initially a two-way (time $\times$ group) repeated measure MANOVA was performed in order to investigate the main effects on the four outcome measures. If a significant time $\times$ group effect was detected, separate two-way (time $\times$ group) repeated measures ANOVAs were performed on the implicated outcome measures. Statistical analysis was conducted using SPSS statistics software version 22.0 (SPSS Inc. Chicago, IL). Significance was accepted at $P < 0.05$.

To test the assumption of normality, Shapiro-Wilk Test was used. For all variables, the significant values of both pretest and posttest of two groups was greater than 0.05. Therefore, normality can be assumed for this data set.

4. Results

Here, the research demographic variables are described using descriptive statistics (mean and standard deviation) in the control and experimental groups and are shown in Table 2.

As can be seen by the frequencies cross tabulated in Table 2, there is no significant difference between the two groups in the educational level ($P = 0.733$, Fisher's exact test), and material status $\chi^2(1, n = 24) = 0.000$, $P = 1.000$.

Additionally, Independent *t*-test did not show a significant difference between the control and experimental groups and control group in the age ($P = 0.501$) and shooting background ($P = 0.298$) variables.

Two-way (time $\times$ group) repeated measures MANOVAs were performed for the groups on the outcome measures.

Table 1. NLP Protocol

Session	Description
First	Contacting with shooters of the experimental group and becoming familiar with their character and shooting experiences, acquainting them with the content of sessions, and teaching success and general goal-setting principles
Second	Defining NLP, describing its history and its techniques' abilities to improve the individual's performance, and explaining NLP presumptions
Third	Training goal-setting principals, dividing goals and the way goals can be fulfilled based on "Eisenhower Decision Principle" in NLP, and determining short term and long term goals
Fourth	Defining NLP "Anchoring" technique and the way it is used practically for increasing self-confidence and helping shooters to create and install an anchor for themselves
Fifth	Explaining and implementing "Golden Ring" technique and presenting a positive self-improvement technique and getting rid of negative self-improvement by explaining and implementing NLP "Timeline" technique
Sixth	Defining neurological levels and Robert Dilts' neurological levels model and the importance of the coordination between these levels
Seventh	Explaining and presenting the "Visual Squash" technique and training and performing a relaxation technique
Eighth	Concluding the training sessions besides getting shooters' verbal feedback about the topics taught and the internal and external changes occurred in their opinion and shooting performance generally

Table 2. Comparison of Demographic Characteristics of the Control and Experimental Groups[a]

Variable	Control Group	Experimental Group	Sig.
Gender			
Male	12	12	
Education			0.733[b]
Bachelor	3 (26)	5 (42)	
Associate degree	2 (16)	1 (8)	
Diploma and sub-diploma	7 (58)	6 (50)	
Marital status			1.000[c]
Single	9 (75)	9 (75)	
Married	3 (25)	3 (25)	
Age, y	24.33 ± 5.974	24 ± 6.208	0.501[d]
Shooting background, mon	21.916 ± 10.723	23.083 ± 11.540	0.298[d]

[a] Values are expressed as No. (%) or mean ± SD.
[b] Fisher exact test.
[c] Chi-square test.
[d] Independent *t*-test.

Table 3. Mean and Standard Deviation of Variables

Variables	Control Group		Experimental Group	
	Pretest	Posttest	Pretest	Posttest
Mental skills	212.25 ± 7.68	209.17 ± 6.55	204.50 ± 15.07	300.50 ± 5.28
Shooting performance (under pressure condition)	519.75 ± 36.10	533.17 ± 27.75	513.67 ± 37.69	565.75 ± 17.65
Shooting performance (ordinary condition)	528.00 ± 35.29	535.92 ± 33.46	530.33 ± 32.56	568.58 ± 17.51

According to the Table 3, the combined analysis of the 3 variables (mental skills and shooting performance in ordinary and under pressure conditions) revealed a significant effect of time from the pretest to the posttest, $F(3, 20) = 158.203$, $P < 0.001$, $\eta^2 = 0.96$ and the power to detect this effect was 1.000. There was also a significant time × group interaction $F(3, 20) = 174.33$, $P < 0.001$, $\eta^2 = 0.96$ and the power to detect this effect was 1.000, which indicates that the two groups differed over time on the 3 outcome measures.

Subsequently conducted 2 × 2 repeated measures ANOVAs indicated that there was a significant main effect of time for all 3 variables: mental skills, $F(1, 22) = 487.66$, $P < 0.001$, $\eta^2 = 0.96$; shooting performance in under pressure condition, $F(1, 22) = 51.992$, $P < 0.001$, $\eta^2 = 0.703$; and shooting performance in an ordinary condition $(1, 22) = 34.876$, $P < 0.001$, $\eta^2 = 0.613$. In all of them, the power to detect these

effects was 1.000.

There was a significant time × group effect for the mental skills F (1, 22) = 554.54, P < 0.001, η^2 = 0.96 with power 1.000; shooting performance in under pressure condition, F (1, 22) = 22.445, P < 0.001, η^2 = 0.505 with power 0.995; and shooting performance in an ordinary condition F (1, 22) = 12.154, P < 0.01, η^2 = 0.356 with power 0.915.

Bonferoni post hoc test showed that in the control group there was no significant difference between the pretest and posttest. But in the experimental group, the mean of posttest scores in mental skills and shooting performance in ordinary and under pressure conditions was significantly more than pretest scores (P < 0.05). In addition, Bonferoni post hoc test showed that in the pretest there was no significant difference between the two groups in four variables, but in the posttest the mean score of the excremental group was significantly more than the control group in mental skills and shooting performance in ordinary and under pressure conditions (P < 0.05).

5. Discussion

The present study aimed to investigate the effectiveness of neuro-linguistic programming (NLP) techniques on shooters' mental skills and their performance.

The first finding of this study showed that NLP techniques have improved shooters' mental skills. This finding is consistent with studies that assessed the effectiveness of NLP techniques on increasing mental health and all of its parameters such as anxiety, depression, sports self-awareness, and athletic self-esteem (30), the ability of goal-setting and being aware of the results, decision-making power, focusing on attention (11), emotional growth, soft-skill development, effective communication skills, and motivation (12, 16).

Perhaps, one of the possible reasons for the effectiveness of NLP techniques on improving shooters' mental skills is to increase their ability to set specific goals and their commitment to achieve them. According to the Locke's Goal-Setting Theory, more ambitious, difficult, and specific goals with time constraints lead to more performance improvement. As long as an individual accepts his clearly identified goals, he has the ability to attain them (31).

The participants of the present study learned the principles of goal-setting in NLP such as how to break goals down into several smaller, short-term goals and achieve them accurately based on their own capabilities.

From the 'Eisenhower Decision Principle', one of NLP goal-setting techniques based on the importance and necessity of activities and time management, shooters learned how to prioritize matters divided into four "important and urgent", "important but not urgent", "not important but urgent", and "not important and not urgent" to make the right decision (32).

Based on the research evidence collected from shooters at the end of each session, internal acceptance and commitment were created when the goals were selected by the athletes. These two factors will make the athletes try and work with more awareness and motivation to achieve their goals (33, 34).

Another possible reason for the effectiveness of NLP on improving shooters' mental skills is to increase their self-awareness and self-confidence. In this regard, the participants of the present study were familiarized with one of the most valuable NLP techniques called "Timeline". In this technique, creating and strengthening any desired tools to achieve success, such as self-confidence, is possible in the shortest time. Traveling mentally to the first time in the past when they were confident, answering to the instructor's related questions during this journey, and returning back to the present time on the same route accompanied by the intended tool achieved (here self-confidence) are main NLP 'Timeline' stages (21).

Sport psychologists define self-confidence, one of the factors of mental skills, as an athletes' ability and personal judgment to be able to successfully pursue and achieve their goals (4, 35). In his theory of self-efficacy, Albert Bandura says that high level of self-efficacy exerts sufficient effort which follows successful outcomes. Believing the innate ability also includes determination and perseverance to overcome obstacles. In stressful situations, psychological factors such as fatigue, shakes, aches and pains, fear, and etc. can significantly be altered by self-confidence improvement (36). Chen et al. also mentioned that self-confidence helps athletes to deal with negative emotions effectively and balance their physical and psychological states.

Of course, other NLP techniques such as "Anchoring", "Golden Ring", and relaxation technique taught in this study, as well as teaching the correct way of visualization and mental imagery to achieve goals, also had positive effects on the shooters' other mental skills parameters. "Anchoring" technique creates a stimulant in association with a physical or emotional state. It creates a pleasant feeling at the moment and causes individuals to focus on their activity (37). By "Golden Ring" technique, a colored cylinder of light, energy or fluid pressure is created to empower and energize individuals at the moment.

Shooters who received NLP techniques such as "Timeline" reported that they obtained fear control and could control their stress reaction. Considering that strengthening and consolidating foundation skills which are main

factors of mental skills are necessary for the development of two other skills (psychosomatic skills and cognitive skills) (38), it can be concluded that NLP has been able to improve shooters' mental skills.

Another finding of this study showed that NLP techniques have improved and raised performance of the shooters and helped them to achieve their optimal performance, especially in under pressure conditions of the competitions. This finding is consistent with studies that assess the effectiveness of NLP techniques on assuming developing athletes' ability of self-assess, becoming fully aware of their sports activity, maintaining focus on their task, reducing anxiety (39), maintaining mental fitness, tolerating pressure in under pressure conditions of the competition, managing the sports performance (40), making quick changes in their behavior by themselves and achieving the desired performance by choosing the best way to communicate with the sports discipline at the national and international levels (6, 11), and improving motivation, achieving educational results, and developing creative thinking (13).

Some of NLP techniques are effective in supporting individual and group sports activities in practical and competitive situations and improve the performance of young and adult athletes. They are also effective in reducing anxiety and emotional distress, developing athletes' attention and concentration (30).

NLP is a unique process which is based on understanding and responding why's, how's, and what's in order to move continuously toward higher potentials, achieving higher professional levels, and achieving optimal performance (16). Through training NLP techniques, we can motivate people and teach them how to better use their conditions and facilities, enjoy the existing conditions, and choose the right goals in order to achieve the desired state (41). The human brain can learn healthy patterns and behaviors in order to make a positive change in achieving a successful behavior (16).

In addition to the above-mentioned items, perhaps one of the possible reasons for the effectiveness of NLP techniques on improving and enhancing performance is using other NLP techniques such as Robert Dilts' six neurological levels model including environment, behavior, talent, belief, value, and identity items and the "Visual Squash" technique.

Robert Dilts, one of the greatest researchers in NLP after Richard Bandler and John Grinder (founders of this psychological intervention), believes that in order to change the individual's behavior, habits, and beliefs, it should be looked at a deeper neurological levels of his personality because changing deep levels of personality will be more stable and durable (14).

Shooters in the experimental group learned how to identify the possible root cause of their behavior or problem when they are setting goals or facing a problem by placing it in one of the relevant levels of this model used to recognize beliefs and behaviors, and then change or solve it by adjusting it to the same level (21). In this model and in order to achieve their goals such as achieving their desired and optimal performance faster, shooters learned to know in which environment they should be and which behaviors, beliefs, values, and identity they need to have.

Using the "Visual Squash" technique, the participants of the present study also observed their current conditions, their goal, and the route taken to achieve their desired goal mentally and then merged their both the present and the future situation together. This technique is to fill the gap between the current and optimal state as well as to create the necessary passion and strong and positive feelings in order to keep moving toward the goal (21).

According to the previous studies and the findings of this study about the important role of personality and mental factors in preparing athletes for the competition and improving their performance (42, 43) it can be simply concluded that the above-mentioned techniques positive effectiveness and changes made in shooters' behavior, personality, and mental skills have been capable of improving their performance.

In addition to the above-mentioned words indicating the effectiveness of NLP techniques on improving the shooters' performance, their positive and reasonable effectiveness on shooters' performance can also be found objectively by considering and comparing their total shooting scores obtained from 2 different ordinary and under pressure conditions in both pretest and posttest stages.

5.1. Conclusions

Generally, findings of the present study showed that improving shooters' mental skills helps athletes maintain their mental fitness and improve their performance, especially in under pressure conditions of the competitions. It is hoped that this research will provide a good foundation for future researches.

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Footnotes

Authors' Contribution: The study was conceived, suggested, and conducted by Shiva Ahmadzadeh. She collected the data and drafted and wrote the whole manuscript. Shiva Ahmadzadeh and Rokhsareh Badami designed the experiment parameters and interpreted the findings together. All authors evaluated the data, performed the statistical analysis, and revised and approved the final version of the manuscript.

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Conflict of Interests: The authors declare that they have no conflict interest.

Ethical Approval: To comply with the principles of the professional ethics, this study (research code: 23821402951027) was completely under the supervision and approval of the Research Ethics Committee of Islamic Azad University, Isfahan (Khorasgan) Branch.

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