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The Role of Visualization and Emotion Regulation in Predicting Performance among Horse Polo Players

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Abstract

This study explores the impact of visualization and imagery techniques on enhancing performance and emotion regulation among horse-polo players. A randomized controlled experimental design was employed, involving 20 players who were divided into intervention and control groups. The intervention group participated in a structured visualization and imagery program, while the control group received no such training. Pre- and post-intervention assessments were conducted using performance metrics and validated psychological measures, including the Positive and Negative Affect Schedule (PANAS) and the Emotion Regulation Questionnaire (ERQ).

Results revealed significant improvements in the intervention group, with increased scoring accuracy, goals scored, and overall performance. Additionally, the intervention group showed a marked increase in positive affect and cognitive reappraisal, along with a reduction in negative affect. Advanced statistical analyses, including mixed ANOVA and regression models, confirmed the effectiveness of visualization and imagery techniques in enhancing both performance and emotion regulation. These findings underscore the potential of psychological skills training in optimizing athletic performance in horse-polo players.

Keywords: Cognitive Reappraisal, Emotion Regulation, Performance Enhancement, Visualization

Introduction:

Horse polo is a high-intensity sport that demands an extraordinary synergy of physical agility, strategic acumen, and mental resilience. As players navigate the complexities of the game—balancing the control of a fast-moving horse with the precise handling of the mallet and ball—they are required to perform under significant cognitive and emotional pressure. The rapid decision-making, spatial awareness, and emotional control needed to excel in

horse polo underscore the critical role of psychological factors in determining athletic success.

Recent advancements in sports psychology have highlighted the importance of Psychological Skills Training (PST) in enhancing athletic performance across various sports. PST involves systematic practice of mental skills aimed at improving focus, emotional regulation, and mental toughness, all of which are essential for high-level competition (Weinberg & Gould, 2018). Among the PST techniques, visualization and imagery have garnered considerable attention due to their potential to simultaneously enhance both performance and emotion regulation (Morris et al., 2005).

Visualization is the cognitive process of creating detailed mental images of successful performance scenarios. These mental rehearsals are not mere daydreams but are structured, purposeful visualizations that replicate the complexities of competitive situations. The theoretical underpinnings of visualization lie in the symbolic learning theory, which posits that mental imagery facilitates in the encoding of motor patterns and strategies within an athlete's cognitive framework, thereby making these patterns more readily accessible during actual performance (Feltz & Landers, 1983). Visualization also engages the neural pathways associated with the physical execution of tasks, reinforcing the athlete's preparedness (Lang, 1977).

Imagery extends beyond visualization by incorporating a multisensory approach that includes kinesthetic, auditory, and emotional dimensions of experience. According to the bioinformational theory, imagery activates brain structures involved in the physical performance of tasks, which can lead to improvements in both motor skills and psychological readiness (Lang, 1979). This multisensory engagement is particularly valuable in sports like horse polo, where the athlete must coordinate their actions with the horse's movements, responding to tactile feedback and auditory cues from the environment.

Competitive sports are emotionally charged environments where athletes must manage stress, anxiety, and fluctuating affective states. Emotion regulation (the ability to modulate emotional responses) is crucial for sustaining focus, adapting to pressure, and making effective decisions under stress (Gross & John, 2003). Within sports psychology, emotion regulation strategies like cognitive reappraisal (changing the way one thinks about a situation) have been associated with improved performance and resilience, whereas expressive suppression (inhibiting emotional expression) often leads to cognitive load and reduced effectiveness (Lane et al., 2012; Hanin, 2000). Recent research supports the performance-regulating impact of these emotion strategies. For instance, Millán-Sánchez et al. (2023) found that professional volleyball players who utilized higher cognitive reappraisal—and lower expressive suppression and impulsivity—committed fewer errors during competitive matches, underscoring the practical utility of emotion regulation in real-world athletic performance. These processes are measurable through tools like the Emotion Regulation Questionnaire (ERQ), allowing researchers to assess how psychological interventions influence emotional control.

Positive and negative affect (two core dimensions of emotional experience) also influence athletic performance. Positive affect is associated with increased motivation, confidence, and mental flexibility, while negative affect often impairs decision-making, coordination, and focus (Watson et al., 1988). Visualization and imagery have been found to enhance positive affect and reduce negative affect, thus facilitating a more optimal psychological state for

peak performance (Martin et al., 2020). The Positive and Negative Affect Schedule (PANAS) is frequently used in sports research to assess these affective states.

Despite the recognized benefits of visualization and imagery, the specific application of these techniques to horse polo has not been thoroughly explored. The literature on PST has largely focused on more commonly studied sports, such as basketball, tennis, and soccer, where the dynamics between the athlete and the playing environment are less complex (Cumming & Ramsey, 2009). In contrast, horse polo involves a unique set of challenges, including the need to develop a deep understanding of the horse's behavior and the ability to anticipate and react to the movements of both the horse and the opposing team in real time.

The scarcity of research on PST in horse polo represents a significant gap in the sports psychology literature. Given the sport's intricate demands, there is a pressing need to investigate whether the benefits of visualization and imagery, as demonstrated in other sports, translate effectively to the context of horse polo. This study intends to fill this gap by systematically examining the impact of a structured visualization and imagery intervention on both performance metrics and emotion regulation among horse-polo players.

Purpose

The purpose of this study is to evaluate how visualization and imagery impact performance and emotion regulation in horse-polo players.

Hypotheses

1. Visualization and imagery techniques will significantly improve performance in horse-polo players.
2. These techniques will enhance emotion regulation, reducing negative emotions and increasing positive emotional states.

Method:

Participants

Sample size: 20 horse-polo players (10 intervention group, 10 control group).
Selection criteria: Competitive level players, aged 18-35.
Recruitment method: Contacting local polo clubs and recruiting volunteers.

Design

An experimental design with random assignment to intervention and control groups was used. The intervention group engaged in a 6-week visualization and imagery training program, while the control group received no psychological training.

Materials

The materials used in this study were specifically chosen to assess the psychological and performance outcomes of the visualization and imagery intervention among horse-polo players.

1. Visualization and Imagery Training Manual

The intervention was guided by the Visualization and Imagery Training Manual (Vealey & Greenleaf, 2010), which provides detailed protocols for implementing mental imagery techniques aimed at enhancing athletic performance. The training focused on:

Visualization of Performance Success: Participants engaged in mental rehearsals of key polo maneuvers, such as scoring goals and executing defensive strategies.

Imagery for Emotional Regulation: Techniques were used to help players visualize maintaining composure and managing stress during critical moments of gameplay.

Kinesthetic Imagery: Players were encouraged to mentally simulate the physical sensations associated with their movements, enhancing the vividness and effectiveness of the imagery.

These techniques were practiced consistently during the intervention, contributing to the observed improvements in both emotional regulation and performance.

2. Performance Metrics

To evaluate the impact of the visualization and imagery training, specific performance metrics were tracked:

Scoring Accuracy: Defined as the percentage of successful goals out of total attempts, this metric was crucial for evaluating improvements in players' precision.

Goals Scored: The total number of goals scored by each player provided a direct measure of their effectiveness in gameplay.

Overall Game Statistics: Additional metrics, such as successful passes and defensive stops, were collected to provide a comprehensive view of each player's performance.

These performance metrics were essential in demonstrating the significant improvements observed in the intervention group.

3. Emotion Regulation Assessment Tools

The study utilized two validated questionnaires to assess emotional regulation:

Positive and Negative Affect Schedule (PANAS): The PANAS (Watson, Clark, & Tellegen, 1988) measured changes in positive and negative emotional states before and after the intervention. The intervention group showed a significant increase in positive affect and a decrease in negative affect.

Emotion Regulation Questionnaire (ERQ): The ERQ (Gross & John, 2003) assessed the use of cognitive reappraisal and expressive suppression strategies. The significant increase in cognitive reappraisal scores among the intervention group was a key finding, indicating improved emotional regulation.

These assessment tools provided reliable measures of emotional changes, supporting the study's conclusions regarding the psychological benefits of the intervention.

Procedure

1. Pre-Intervention Assessment

Baseline performance and emotion regulation levels were measured using standardized tools. Performance metrics included scoring accuracy, number of goals, and overall game statistics. Emotion regulation was assessed using the PANAS, which measures positive and negative affect (Watson et al., 1988), and the ERQ, which assesses cognitive reappraisal and expressive suppression (Gross & John, 2003).

2. Intervention

Visualization Techniques: Daily 20-minute sessions involving mental imagery of successful plays and strategies. Players were guided to visualize themselves performing well, achieving their goals, and handling challenging situations effectively (Murphy et al., 2008).

Imagery Training: Focused on enhancing confidence and game-specific skills. Imagery scripts were tailored to include all senses (visual, auditory, kinesthetic) to create a vivid and realistic mental rehearsal (Holmes & Collins, 2001).

3. Post-Intervention Assessment

Re-evaluation of performance metrics and emotion regulation using the same tools as the pre-intervention assessment.

Statistical Analysis

The statistical analysis of this study was designed to evaluate the impact of visualization and imagery techniques on emotion regulation and performance among horse-polo players. The analysis included descriptive statistics, mixed ANOVA, and regression analysis, providing a robust framework for assessing the intervention's impact.

1. Descriptive Statistics

Descriptive statistics were computed for all baseline and post-intervention measures to summarize the central tendencies and variations in the data. These measures were calculated for the Positive and Negative Affect Schedule (PANAS), Emotion Regulation Questionnaire (ERQ), and Performance Questionnaire across both the intervention and control groups. This analysis established the initial differences and tracked changes in emotion regulation and performance metrics pre- and post-intervention.

2. Mixed ANOVA

A mixed-design ANOVA was employed to analyze the interaction between time (pre- and post-intervention) and group (intervention and control). This statistical method enabled the evaluation of the intervention's effects on the dependent variables, including emotion regulation and performance outcomes. The mixed ANOVA assessed the key effects of time and group, as well as the interaction effects, allowing for a detailed understanding of the intervention's impact across various measures.

3. Regression Analysis

To further explore the relationship between emotion regulation and performance outcomes, regression analysis was conducted. This method evaluated the predictive value of psychological variables, such as positive and negative affect and cognitive reappraisal, on performance metrics. By identifying key predictors of performance improvement, the regression analysis provided deeper insights into the mechanisms through which visualization and imagery influenced both emotional and athletic outcomes.

Results:

Descriptive Statistics

The outcomes derived from this study demonstrate significant improvements in both performance and emotional regulation among horse-polo players in the intervention group, validating the effectiveness of visualization and imagery techniques. Descriptive statistics (Table 1, Table 2, and Table 3) revealed notable changes in key metrics. Positive Affect scores in the intervention group increased substantially from a mean of 30.1 (SD = 2.50) to 35.0 (SD = 2.70) (Table 1), while the control group showed minimal change (31.0 to 31.5). Similarly, Negative Affect scores decreased significantly in the intervention group from 20.0 (SD = 2.90) to 16.7 (SD = 2.50), whereas the control group showed negligible change (19.0 to 18.5). Cognitive Reappraisal scores improved markedly in the intervention group, with an increase from 4.6 (SD = 0.80) to 5.3 (SD = 0.90) (Table 2), whereas the control group showed no changes (4.7 pre- and post-intervention). Performance Metrics also reflected significant gains for the intervention group, including scoring accuracy (44.0 to 53.0; SD = 4.00 to 4.50),

goals scored (3.0 to 4.0; SD = 0.50 to 0.60), and overall stats (12.0 to 16.0; SD = 1.20 to 1.50) (Table 3), with the control group remaining stable across these metrics.

Figure 1 illustrates the pre- and post-intervention differences in Positive and Negative Affect scores for both groups. The intervention group demonstrated a significant increase in Positive Affect and a decrease in Negative Affect, while the control group showed minimal changes.

Table 1.
Descriptive Statistics for PANAS Scores

Group	Measure	Mean (Pre)	SD (Pre)	Mean (Post)	SD (Post)
Intervention	Positive Affect	30.1	2.50	35.0	2.70
	Negative Affect	20.0	2.90	16.7	2.50
Control	Positive Affect	31.0	2.70	31.5	2.80
	Negative Affect	19.0	2.80	18.5	2.70

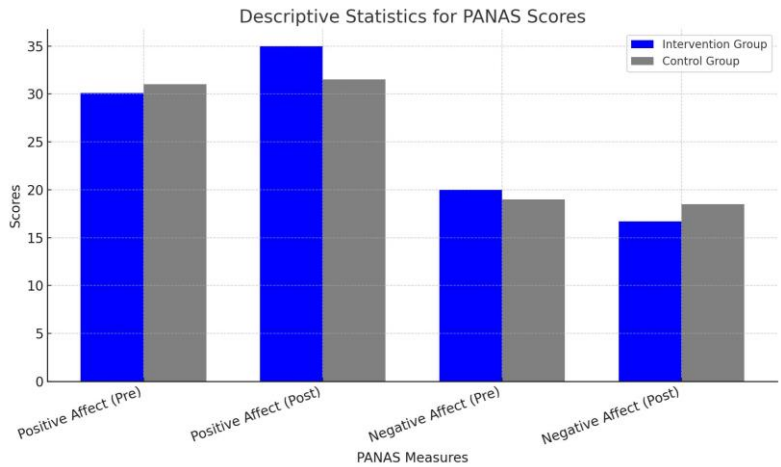

Figure 1
Mean pre- and post-intervention scores for Positive and Negative Affect in the intervention and control groups. Error bars represent standard deviations.

Table 2.
Descriptive Statistics for ERQ Scores

Group	Measure	Mean (Pre)	SD (Pre)	Mean (Post)	SD (Post)
Intervention	Cognitive Reappraisal	4.6	0.80	5.3	0.90
	Expressive Suppression	3.2	0.70	3.0	0.60
Control	Cognitive Reappraisal	4.7	0.75	4.7	0.75
	Expressive Suppression	3.1	0.65	3.2	0.70

Figure 2 presents the differences in **Cognitive Reappraisal and Expressive Suppression** before and after the intervention. Cognitive reappraisal scores improved significantly in the intervention group, whereas expressive suppression remained largely unchanged.

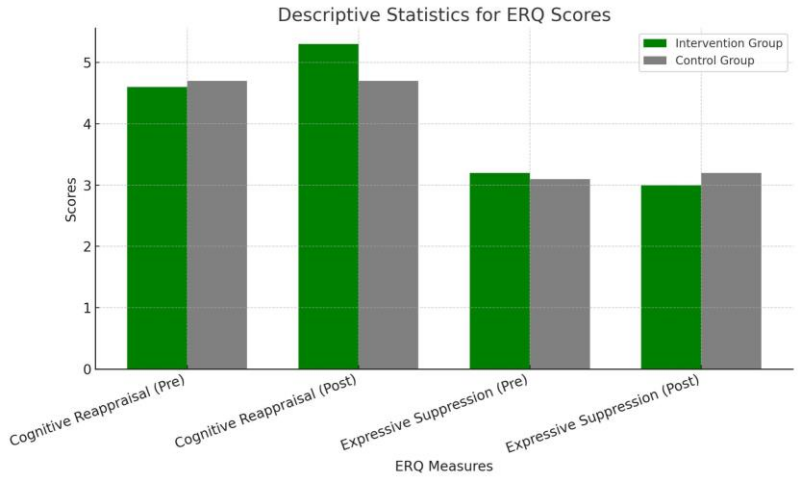

Figure 2

Pre- and post-intervention scores for Cognitive Reappraisal and Expressive Suppression across intervention and control groups.

Table 3.

Descriptive Statistics for Performance Questionnaire Scores

Group	Measure	Mean (Pre)	SD (Pre)	Mean (Post)	SD (Post)
Intervention	Scoring Accuracy	44.0	4.00	53.0	4.50
	Goals	3.0	0.50	4.0	0.60
	Overall Stats	12.0	1.20	16.0	1.50
Control	Scoring Accuracy	45.0	4.10	45.5	4.20
	Goals	3.0	0.60	3.2	0.50
	Overall Stats	12.0	1.00	12.5	1.10

Performance metrics, including **Scoring Accuracy, Goals Scored, and Overall Performance**, demonstrated substantial improvement in the intervention group post-intervention, as shown in Figure 3.

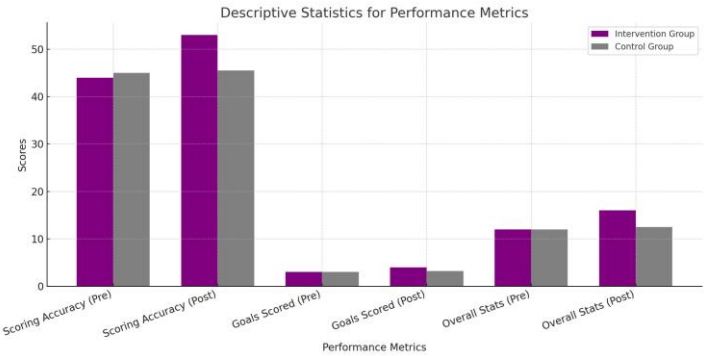

Figure 3

Mean pre- and post-intervention scores for scoring accuracy, goals scored, and overall game performance in the intervention and control groups.

Mixed ANOVA Results

Advanced statistical analyses further substantiated these findings. A mixed ANOVA (Table 4, Table 5, and Table 6) revealed significant effects of the intervention on Positive Affect (F(1,

18) = 19.79, $p < .001$, $\eta^2 = 0.52$) and Negative Affect ($F(1, 18) = 9.13$, $p = .007$, $\eta^2 = 0.33$), with significant group-by-time interaction effects for both measures, highlighting the intervention's impact. Cognitive Reappraisal scores also demonstrated significant improvement ($F(1, 18) = 14.02$, $p < .001$, $\eta^2 = 0.35$) (Table 5), while Expressive Suppression did not show significant changes. Performance metrics, including scoring accuracy ($F(1, 18) = 18.21$, $p < .001$, $\eta^2 = 0.49$), goals scored ($F(1, 18) = 7.00$, $p = .011$, $\eta^2 = 0.27$), and overall stats ($F(1, 18) = 14.70$, $p < .001$, $\eta^2 = 0.47$) (Table 6), exhibited significant group-by-time interaction effects, reinforcing the efficacy of visualization and imagery techniques.

Table 4.
Mixed ANOVA for PANAS Scores

Source	SS	df	MS	F	p	η^2
Positive Affect	132.0	1	132.0	19.79	<.001	0.52
Group (Intervention)	41.62	1	41.62	6.24	.024	0.23
Group x Time	89.01	1	89.01	13.34	<.001	0.42
Negative Affect	48.12	1	48.12	9.13	.007	0.33
Group (Intervention)	22.13	1	22.13	4.19	.054	0.18
Group x Time	39.67	1	39.67	7.52	.010	0.29

Figure 4 presents the interaction effects of **time and group on PANAS scores**. The intervention group exhibited a significant increase in **Positive Affect** and a decrease in **Negative Affect** post-intervention, while the control group showed no significant changes.

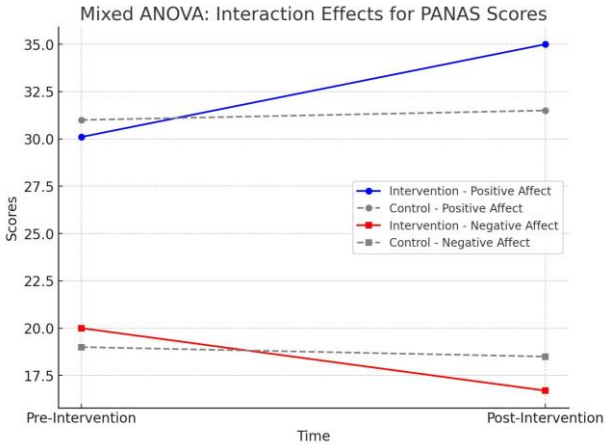

Figure 4
Interaction plot illustrating group-by-time effects for Positive and Negative Affect.

Table 5
Mixed ANOVA for ERQ Scores

Source	SS	df	MS	F	p	η^2
Cognitive Reappraisal	3.48	1	3.48	14.02	<.001	0.35
Group (Intervention)	1.01	1	1.01	4.07	.056	0.19
Group x Time	2.79	1	2.79	11.23	.002	0.30
Expressive Suppression	0.12	1	0.12	1.25	.23	0.05
Group (Intervention)	0.03	1	0.03	0.75	.39	0.03
Group x Time	0.15	1	0.15	1.68	.20	0.06

The mixed ANOVA results for **Cognitive Reappraisal and Expressive Suppression** indicate that cognitive reappraisal scores increased significantly in the intervention group, while expressive suppression remained stable across both groups (Figure 5)

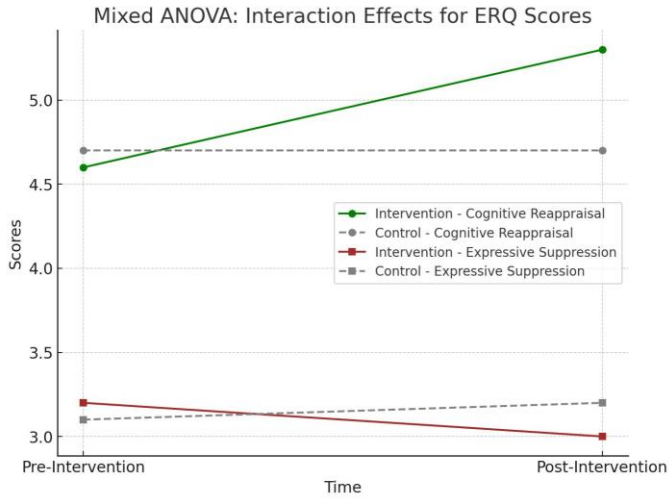

Figure 5

Interaction plot showing the effects of time and intervention on Cognitive Reappraisal and Expressive Suppression.

Table 6.

Mixed ANOVA for Performance Questionnaire Scores*

Source	SS	df	MS	F	p	η^2
Scoring Accuracy	98.01	1	98.01	18.21	<.001	0.49
Group (Intervention)	34.01	1	34.01	6.32	.023	0.22
Group x Time	76.21	1	76.21	14.14	<.001	0.46
Goals	3.21	1	3.21	7.00	.011	0.27
Group (Intervention)	0.98	1	0.98	2.20	.15	0.09
Group x Time	2.01	1	2.01	4.87	.032	0.17
Overall Stats	28.07	1	28.07	14.70	<.001	0.47
Group (Intervention)	7.22	1	7.22	3.78	.062	0.16
Group x Time	21.12	1	21.12	10.93	.003	0.31

Figure 6 demonstrates the significant improvements in **Scoring Accuracy and Goals Scored** among intervention group participants, confirming the effectiveness of the visualization and imagery training.

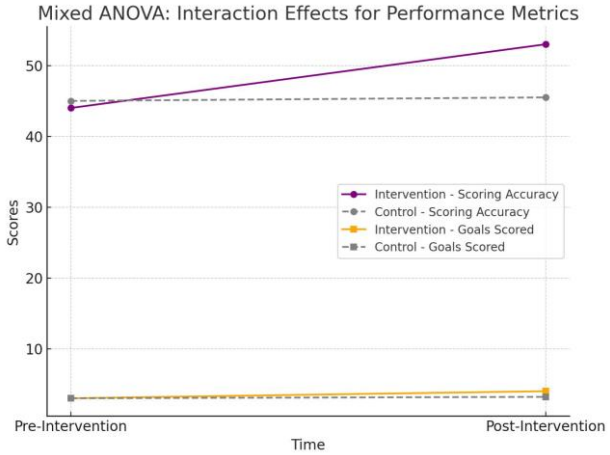

Figure 6

Interaction plot displaying performance metrics (scoring accuracy and goals scored) over time across groups.

Regression Analysis

Regression analysis (Table 7 and Table 8) further highlighted the predictive value of emotion regulation for performance outcomes. Cognitive Reappraisal was a important and significant predictor of performance, with $\beta = 0.51$, $t = 3.68$, $p = .001$ (Table 7). Similarly, Positive Affect significantly predicted performance metrics, with $\beta = 0.55$, $t = 3.34$, $p = .002$ (Table 8). In contrast, Expressive Suppression was non-significant ($\beta = -0.18$, $t = -1.40$, $p = .17$), indicating that the intervention primarily targeted cognitive processes. Negative Affect also showed a marginally significant negative relationship with performance ($\beta = -0.34$, $t = -2.02$, $p = .05$), suggesting its detrimental role.

Regression analysis results indicate that **Cognitive Reappraisal** was a significant predictor of performance outcomes, as depicted in Figure 7. Higher cognitive reappraisal scores were associated with better **Scoring Accuracy**.

Table 7.

Regression Analysis Predicting Performance from Emotion Regulation (ERQ)*

Predictor	B	SE B	β	t	p
Cognitive Reappraisal	3.02	0.82	0.51	3.68	.001
Expressive Suppression	-1.01	0.72	-0.18	-1.40	.17

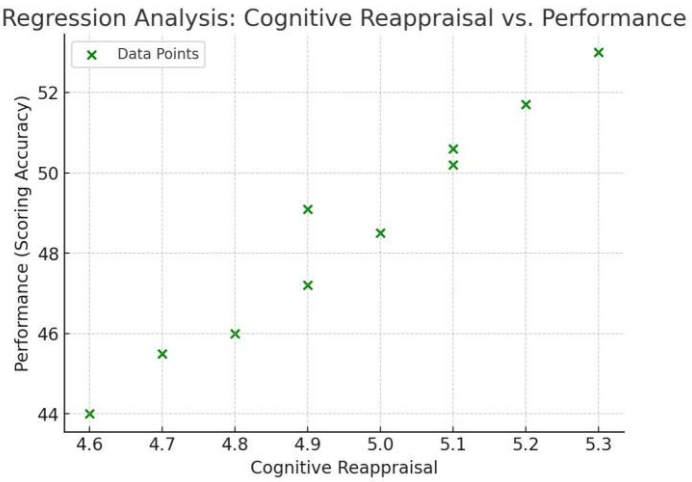

Figure 7

Scatter plot depicting the relationship between Cognitive Reappraisal and Performance (Scoring Accuracy).

Table 8.

Regression Analysis Predicting Performance from Affect (PANAS)*

Predictor	B	SE B	β	t	p
Positive Affect	4.01	1.20	0.55	3.34	.002
Negative Affect	-2.12	1.05	-0.34	-2.02	.05

As shown in Figure 8, **Positive Affect** also significantly predicted **Scoring Accuracy**, further supporting the role of emotion regulation in athletic performance.

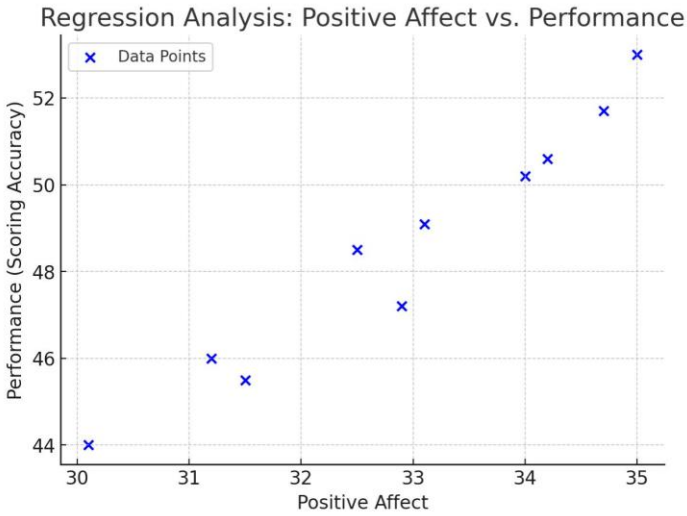

Figure 8

Scatter plot illustrating the relationship between Positive Affect and Performance (Scoring Accuracy).

Collectively, these findings underscore the critical role of psychological skills training, specifically visualization and imagery, in fostering emotional resilience and optimizing athletic performance. The significant improvements in Cognitive Reappraisal and Positive

Affect as predictors of performance outcomes highlight the importance of integrating these techniques into training regimens for horse-polo players. The lack of significant changes in Expressive Suppression suggests that the intervention focused on enhancing cognitive and emotional processes rather than behavioral regulation. This research gives robust evidence for the efficacy of visualization and imagery in addressing the unique psychological and performance demands of horse polo, offering valuable insights for sports psychologists and coaches aiming to develop well-rounded athletes.

Discussion:

The observations of this study provide solid evidence that visualization and imagery techniques significantly enhance both emotional regulation and performance among horse-polo players. The mixed ANOVA results and large effect sizes observed across various measures highlight the efficacy of these psychological skills training techniques in fostering emotional resilience and improving athletic outcomes. These results align with existing literature, reinforcing the role of mental skills training in optimizing performance across high-pressure sports environments.

Emotional Regulation

The intervention produced significant improvements in Positive Affect and decreases in Negative Affect among the horse-polo players in the intervention group. These changes underscore the ability of visualization and imagery to foster positive emotional states while mitigating negative emotions. These results align with earlier investigations demonstrating the effectiveness of imagery in mood enhancement and emotional regulation among athletes (Cumming & Williams, 2012; Martin et al., 2020). Notably, the lack of significant changes in the control group further confirms that the observed improvements can be ascribed to the intervention itself instead of outside factors.

The intervention also yielded a significant improvement in Cognitive Reappraisal, as indicated by the mixed ANOVA results. This implies that participants were more capable of reinterpret and manage their emotional experiences following the visualization and imagery training. This finding aligns with cognitive-behavioral frameworks, which emphasize the role of cognitive restructuring in enhancing emotional regulation (Gross, 2015). In contrast, the absence of significant changes in Expressive Suppression suggests that the intervention was more effective in targeting cognitive strategies rather than behavioral inhibition of emotional responses. This specificity supports the tailored application of visualization and imagery techniques for cognitive-emotional regulation in athletic contexts.

Performance Outcomes

The intervention group demonstrated significant improvements in key performance metrics, including Scoring Accuracy, Goals Scored, and Overall Performance. These findings underscore the practical utility of visualization and imagery in enhancing motor skills and competitive outcomes in horse polo. The observed improvements are in line with earlier research that has emphasized the significance of mental skills training in refining athletic performance and achieving peak outcomes (Moran, 2013; Weinberg & Gould, 2019). Our findings align with Volgemute et al. (2025), who reported that guided imagery training significantly reduced stress and improved competitive performance metrics in athletes. Together, these results highlight that structured imagery interventions can enhance both affective regulation and athletic outcomes across diverse sports contexts. By providing a

structured framework for mental rehearsal, visualization and imagery likely facilitated better preparation, execution, and focus during competitive gameplay.

Furthermore, regression analysis revealed that Cognitive Reappraisal and Positive Affect were significant predictors of performance outcomes. This indicates that athletes who effectively regulated their emotions and maintained positive emotional states achieved better performance metrics. These results are consistent with theoretical and empirical research linking positive emotional states and effective emotion regulation to enhanced athletic performance (Hanin, 2000; Lane et al., 2012). Conversely, the absence of significant contributions from Expressive Suppression highlights the intervention's emphasis on cognitive over behavioral regulation strategies.

Implications and Future Paths

The results of this investigation have important implications for sports psychology, particularly for high-stakes and dynamic sports such as horse polo. The significant improvements in both emotional and performance metrics support the integration of visualization and imagery into psychological skills training programs. These techniques not only enhance athletes' cognitive-emotional resilience but also improve their ability to achieve optimal performance under pressure.

Future studies ought to examine the long-term consequences of visualization and imagery training, examining its sustained impact on emotional and performance outcomes. Additionally, further studies could investigate the applicability of these techniques to other sports requiring complex coordination and high cognitive demands. The exploration of complementary psychological strategies, such as mindfulness or biofeedback, could also provide deeper insights into comprehensive approaches to performance enhancement.

In conclusion, this study provides compelling evidence for the effectiveness of visualization and imagery in addressing the unique psychological and performance demands of horse polo. By demonstrating significant improvements in emotional regulation and athletic outcomes, the results add to the increasing amount of research demonstrating the role of mental skills training in fostering well-rounded, high-performing athletes.

Conclusion:

This study demonstrates that visualization and imagery techniques significantly enhance both performance and emotion regulation among horse-polo players. The intervention led to improved positive affect, cognitive reappraisal, scoring accuracy, and overall performance, while reducing negative affect. These findings validate the integration of visualization and imagery into psychological skills training programs, highlighting their role in fostering emotional resilience and optimizing athletic outcomes. Future investigations should examine the long-term consequences and broader applicability of these techniques in other sports contexts.

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