COMPETITIVE SPORT: FROM PSYCHOLOGICAL WARFARE TO PLAYGROUND BATTLE

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Abstract:

Background and Objectives: Emotions encompass collective functional behaviors and action dispositions that wield profound influence over our perception, cognition, and conduct. Our study is dedicated to the identification and comprehension of human emotions, achieved through the utilization of the International Affective Picture System (IAPS) and the Self-Assessment Manikin (SAM) rating scale. Furthermore, our investigation seeks to juxtapose the emotional perception and responsiveness of competitive athletes against those who do not partake in competitive activities.

Methods: Thirty competitively athletic male cricket players and thirty males playing non competitive cricket were selected to undergo the emotional stressor according to IAPS and the perceived emotions were recorded in three dimensional spaces (valence, arousal and dominance domain) according to SAM.

Results: The non-competitive group found pleasant pictures slightly more pleasant ($p>0.05$) in valence, significantly more exciting ($p<0.05$) in arousal, and slightly more independent ($p>0.05$) in dominance compared to the competitive group. For neutral pictures, the competitive group perceived them significantly more pleasant ($p<0.05$) and slightly more independent ($p>0.05$) in valence and dominance, respectively. Unpleasant pictures were significantly more unpleasant ($p<0.05$) and dull ($p<0.05$) in arousal for the competitive group.

The competitive group has significantly lower ($p<0.05$) resting HR, slightly lower SBP, DBP, and RR, and slightly higher SV and CO than the non-competitive group.

The competitive group has significantly higher STAI-T scores and significantly lower HR, SBP, and DBP, slightly lower RR, and significantly higher SV and CO. Salivary cortisol is significantly higher in the non-competitive group along with significantly higher HR, SBP, DBP, and RR, slightly lower SV and CO.

Conclusion: The research divulges a nuanced interplay between cognitive and somatic anxiety, intricately shaping athlete performance. While athletes manifest physical resilience, acute stress poses profound psychological challenges, underscoring the imperative of mental fitness in tandem with physical training. The study advocates bespoke mental fitness regimens for athletes, addressing emotional imbalance and competitive anxiety, with the capacity to elevate both performance and overall well-being. In the dynamic sports landscape, a holistic paradigm that seamlessly integrates mental and physical well-being emerges as indispensable for attaining excellence and preserving health.

Key Words: athletes, emotions, IAPS, SAM.

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Introduction:

Emotions are a profoundly personal and conscious phenomenon, primarily expressed through both psycho-physiological reactions and biological responses. Moreover, emotions form a complex realm of sensations that hold significant sway over our performance [1]. As Izard (1977) [2] eloquently conveys, emotions are intricately multifaceted, encompassing behavioral, physiological, and experiential facets. Their profound impact on human performance underscores their indispensable role in the domain of human cognition and behavior research.

In the realm of sports competitions, where emotions run high, understanding these intricate emotional facets becomes even more critical [3]. Given that athletes frequently pursue personally meaningful goals within the context of unpredictable outcomes, they often encounter heightened states of both positive and negative emotions. While it is well-documented that exercise and sports participation offer mental health benefits, it is vital to recognize that athletes, on occasion, grapple with psychological, emotional, and behavioral challenges [4]. A thorough understanding of the pivotal role emotions play in sports competitions significantly contributes to our broader understanding of regulating human behavior, with potential applications in assisting practitioners to more effectively support athletes in managing their emotions (Wagstaff, 2014) [5].

Hackfort and Spielberger (1989) [6] identified burnout as arising from "high or conflicting demands, leading to overload, combined with low social support, autonomy, rewards, and demands, ultimately resulting in boredom." This burnout leads to a sudden loss of motivation and an inability to cope emotionally with their circumstances. As a result, there is a noticeable decline in performance, causing athletes to lose their passion for their sport and disrupt their athletic routine. This underscores the need for a comprehensive examination and quantification of athletes' emotional reactivity.

The International Affective Picture System (IAPS) test serves as a valuable tool for evaluating emotional responses to a wide range of stimuli. An athlete's ability to regulate their emotions can serve as a predictive factor for their performance success [7] [8]. Understanding an athlete's emotional reactivity empowers coaches to design training sessions that consider their mental state, fostering a more positive and focused approach to both preparation and competition. Additionally, it helps alleviate the fear of failure and reduce the risk of physical injury due to emotional imbalances.

This study represents one of the rare initiatives that employ the IAPS and Self-Assessment Manikin (SAM) to meticulously observe and record emotional variations between competitive athletes and non-competitive individuals. The insights derived from this research have the potential to greatly benefit sports coaches and sports psychologists, enabling them to develop effective goals and strategies that encompass the emotional well-being of athletes.

Material and Methods:

1. Source of Data: 30 male athletes indulging in competitive cricket training (semi-professional and state-level players) for more than 5 years aged between 14-19 years from a private cricket coaching academy.

The comparator group had 30 males of the same age group playing non competitive cricket only for fun.

All the procedures followed were in accordance with the ethical standards of the institutional committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 2000. This study has received approval of the Institutional Ethics Committee, obtaining informed consent from adult research participants and obtaining assent for children aged over 7 years participating in the study.

2. Study design: A Comparative Study

3. Study period: 3 months

4. Sample size: Total of 60 participants with 30 in each group

Formula –

The sample size (n) is calculated according to the formula:

$n = [z2*p*(1-p)/e2]/[1+(z2*p*(1-p)/(e2*N))]$

Where:

$z = 2.33$ for a confidence level $\alpha = 98\%$,

p = proportion (expressed as a decimal),

N = population size,

e = margin of error.

$z = 1.96$, $p = 0.95$, $N = 60$, $e = 0.046$

$n \approx 26$, $2n = 52$

Anticipating 10% loss to follow up

$2n \approx 60$

n = 30 in each group

5. Sampling technique: Purposive Sampling

Inclusion criteria:

(a) Males aged between 14-19 years, indulging in competitive cricket for minimum 5
years.

(b) Competitive athletes who are training in cricket for at least 3 days a week for more than 3 hours a day.

Exclusion criteria:

(a) Those who have a history of childhood trauma, PTSD.

(b) Those who are suffering from psychiatric illnesses.

Procedure:
In a soundproof room, subjects were exposed to emotional stressors using the International Affective Picture System, with ratings obtained through Self-Assessment Manikin. They were seated in comfortable chairs, and baseline readings for systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), respiratory rate (RR), stroke volume (SV), and cardiac output (CO) were recorded. Subjects were provided with an explanation of the protocol and wore noise-canceling headphones.

A PowerPoint presentation displayed 15 shuffled images of Paul Ekman's facial expressions, representing the seven basic emotions: happiness, anger, disgust, sadness, contempt, surprise, and fear. Paul Ekman theorized that some basic human emotions are innate and shared by everyone, and that they are accompanied across cultures by universal facial expressions while many of the apparent differences in facial expressions across cultures were due to context. He also co-discovered micro facial expressions. According to him, no emotion exists as a single affective or psychological state. Instead, emotions are a family of related emotional states which are variations on a shared theme.

The procedure began with a 30-second baseline period where subjects closed their eyes and maintained silence. After a 2-second warning, each image was displayed for 6 seconds, and subjects were asked to rate the picture based on SAM (valence, arousal, and dominance) within 15 seconds. Following this, a 30-second resting period ensued before the next image, during which subjects once again closed their eyes and remained silent. This cycle was repeated for all 15 images.

Throughout this procedure, measurements of SBP, DBP, HR, RR, SV, CO, and salivary cortisol were recorded. Recovery readings for these parameters were also obtained.

DATA collection instruments:

a) Testing of the salivary cortisol content during the experiment, which is a biomarker for acute stress in both experimental and non-experimental groups.

Test used- Elecsys Cortisol II Assay
Range- 1.5-1750 nmol/L or 0.054-63.4 µg/dL
Sensitivity-
- Limit of Blank= 1.0 nmol/L (0.036 µg/dL)
- Limit of Detection= 1.5 nmol/L (0.054 µg/dL)
- Limit of Quantitation= 3.0 nmol/L (0.109 µg/dL)

b) Resting, during the experiment, and recovery testing of blood pressure, heart rate, pulse rate, respiratory rate and cardiac output.

c) State-Trait Anxiety Inventory— [9]
It was developed by Charles D. Spielberger, Richard L. Gorsuch, and Robert E. Lushene in the late 1960s. The STAI-T was used in this study, comprising 20 items:

State Anxiety Scale (STAI-T):
The Trait Anxiety Scale assesses an individual's general propensity to experience anxiety as a stable personality trait over time. It measures how a person typically feels, regardless of the current situation, indicating their relatively stable and enduring anxiety levels. The responses are based on a 4-point Likert-type scale ranging from 1 (Not at all) to 4 (Very much so).

Scoring and Interpretation:
The total score for STAI-T is calculated by summing the responses to the respective 20 items. Higher scores on the STAI-T indicate higher levels of current trait anxiety.

d) International Affective Picture System-- [10]
It was developed by Dr. Richard J. Davidson and his colleagues at the National Institute of Mental Health Center for the Study of Emotion and Attention at the University of Florida. It is a standardized set of images that are widely used in research to elicit emotional responses from participants. These images represent various emotional categories, such as happiness, fear, sadness, disgust, and so on. Researchers use the

IAPS to study emotional processing, emotional responses, and other related phenomena.

Participants are typically shown these images and then asked to rate their emotional experiences in response to each image according to the Self-Assessment Manikin (SAM). It is a pictorial rating scale designed to measure subjective emotional experiences. The Self-Assessment Manikin typically consists of three pictorial scales, each representing a different dimension of emotional experience:

1. Affective Valence: This scale measures the pleasure or displeasure of the emotional experience. It ranges from a smiling, happy figure on one end to a frowning, unhappy figure on the other end.
2. Arousal: This scale assesses the level of physiological and psychological activation or arousal associated with the emotional experience. It ranges from a relaxed, calm figure on one end to an excited, highly aroused figure on the other end.
3. Dominance: This scale gauges the perceived level of control or dominance experienced during the emotional state. It ranges from a submissive, powerless figure on one end to a dominant, in-control figure on the other end.

Participants are asked to choose the manikin that best represents their emotional state in response to a given stimulus or situation.

e) Modified Stroke Volume Formula: [11]
SV= 100 - 0.6 (Age) - 0.6 (DBP) + 0.5 (Pulse Pressure) * Body Surface Area/1.7
CO= SV * HR

Statistical Analysis:
(I) Quantitative data was collected using Microsoft Excel, and normality analysis was conducted with SPSS software version 25, reporting the results as Mean ± SD.

Result: In Table 2, the non-competitive population perceived the pleasant pictures in valence space as slightly more pleasant (20.2 ± 6.69), the pleasant pictures in arousal space as significantly more exciting (18.133 ± 8.21), and the pleasant pictures in dominance space as slightly more independent (15 ± 6.27), than the competitive population. The competitive population perceived the neutral pictures in valence space as significantly more pleasant (11.916 ± 4.68), the neutral pictures in arousal space as slightly more dull, and the neutral pictures in the dominance space slightly more independent, than the non-competitive population. The competitive population perceived the unpleasant pictures in valence as significantly more unpleasant (12.167 ± 3.58), the unpleasant pictures in arousal space as significantly more dull (12.75 ± 3.92), and the unpleasant pictures in dominance space as slightly more independent (16.5 ± 7.36) than the non-competitive population.

In Table 3, the STAI-T scores of the competitive population are significantly more than the non-competitive population.

In Table 4, the salivary cortisol is significantly more elevated (3.9 ± 3.59) in the non-competitive population than in the competitive population.

In Fig. 1, the competitive population has significantly lower ($p<0.05$) resting HR, slightly lower SBP, DBP and RR, and slightly higher SV and CO than the non-competitive population. In Fig. 2, the HR is significantly higher, SBP, DBP, and RR are slightly higher and SV and CO are slightly lower, in non-competitive individuals compared to competitive individuals. In Fig. 3, the competitive population has significantly lower HR, SBP, and DBP, slightly lower RR, and significantly higher SV and CO than the non-competitive population.

Table 1.Socio-demographic details of the study population. In total, 60 males whose average age was 16 years were taken for this study.

MEAN AGE	**16 years**
GENDER	**Male**
MEAN EDUCATION	**9th standard pass**
COMPETITIVE	**30 individuals**
NON-COMPETITIVE	**30 individuals**

Table.1. Mean scores for all the three categories while viewing the pictures, in comparison between competitively athletic (n=30) vs non-competitive (n=30) populations. ± represents standard deviation.

CATEGORY (PLEASANT)	COMPETITIVE (n=30)	NON-COMPETITIVE (n=30)	P VALUE
Valence	19.25 ± 7.25	20.2 ± 6.69	0.6
Arousal	15.5 ± 8.11	18.133 ± 8.21	0.004*
Dominance	13.416 ± 3.116	15 ± 6.27	0.412
CATEGORY (NEUTRAL)	COMPETITIVE (n=30)	NON-COMPETITIVE (n=30)	P VALUE
Valence	11.916 ± 4.68	9.933 ± 5.55	0.001*
Arousal	12 ± 7.54	13.67 ± 7.331	0.05*
Dominance	15.33 ± 5.61	14.867 ± 7.39	0.13
CATEGORY (UNPLEASANT)	COMPETITIVE (n=30)	NON-COMPETITIVE (n=30)	
Valence	12.167 ± 3.58	8.533 ± 4.89	0.001*
Arousal	12.75 ± 3.92	14.4 ± 3.14	0.004*
Dominance	16.5 ± 7.36	15.33 ± 8.138	0.8

***- statistically significant, p<0.05**

Table 3: Mean State Trait Anxiety Inventory (STAI-T) scores in comparison between competitivelyathletic (n=30) vs non-competitive (n=30) populations. ± represents standard deviation.

MEAN PARAMETER	STAI-T SCORE	P VALUE
COMPETITIVE (n=30)	52.416 ± 4.13	0.0001*
NON-COMPETITIVE (n=30)	48.67 ± 5.42	

***- statistically significant, p<0.05**

Table 4: Mean salivary cortisol during the overall emotional stressor in comparison between competitively athletic (n=30) vs non-competitive (n=30) populations. ± represents standard deviation.

MEAN PARAMETER	COMPETITIVE n=(30)	NON-COMPETITIVE n=(30)	P VALUE
SALIVARY CORTISOL (µg/100ml)	3.3 ± 1.35	3.9 ± 3.59	0.0001*

***- statistically significant, p<0.05**

Fig. 1: (A) Heart rate (HR), (B) Systolic blood pressure (SBP), (C) Diastolic blood pressure (DBP), (D) Stroke volume (SV), (E) Cardiac output (CO) and (F) Respiratory rate (RR), prior to the emotional stressor in comparison between competitively athletic (n=30) vs non-competitive (n=30) populations. ± represents standard deviation.

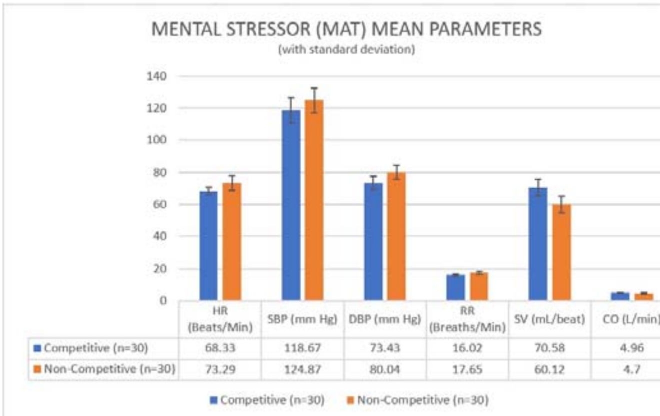


Fig. 2: (A) Heart rate (HR), (B) Systolic blood pressure (SBP), (C) Diastolic blood pressure (DBP), (D) Stroke volume (SV), (E) Cardiac output (CO) and (F) Respiratory rate (RR), during the administration of the emotional stressor, in comparison between competitively athletic (n=30) vs non-competitive (n=30) populations. ± represents standard deviation.

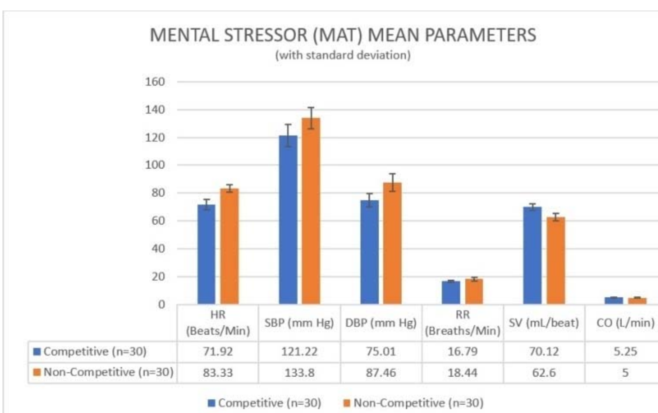
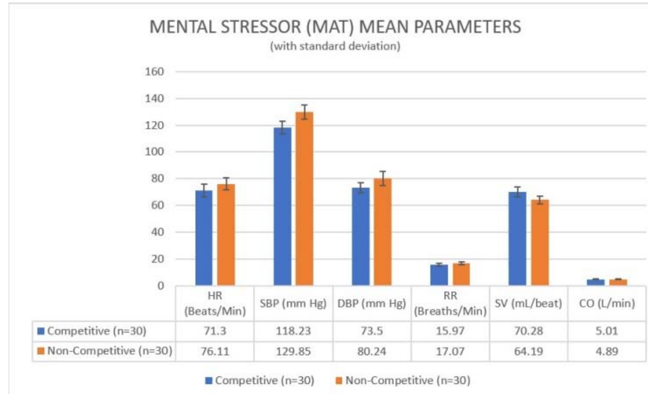


Fig. 3: (A) Heart rate (HR), (B) Systolic blood pressure (SBP), (C) Diastolic blood pressure (DBP), (D) Stroke volume (SV), (E) Cardiac output (CO) and (F) Respiratory rate (RR), during the recovery period after the emotional stressor in comparison between competitively athletic (n=30) vs non-competitive (n=30) populations. ± represents standard deviation.



Discussion: Our study involved 30 highly skilled competitive athletes with over 5 years of experience in semi-professional cricket, alongside 30 non-competitive players engaging in cricket for recreational purposes.

It is widely acknowledged that emotions wield considerable influence over decision-making, personality, and overall behavior—a truth that extends to competitive athletes. Research underscores that, while a certain degree of stress within physiological bounds is advantageous for athletes in managing the physical demands on their bodies, exceeding this threshold markedly impairs performance and efficiency [12]. Athletes with elevated levels of sports anxiety and heightened susceptibility to stress exhibit acute sensitivity to the behavior of others [13]. They demonstrate heightened sensitivity to negative emotions such as anxiety, while positive emotions exert a diminished impact and receive less acknowledgment. This is evidenced in the ratings on the Self-Assessment Manikin (SAM) for pleasant pictures, where competitive athletes perceived them as less pleasurable, less exhilarating, and less dominant. Unpleasant pictures, conversely, were perceived as more distressing, duller, and more independent by the competitive population.

Negative emotions tend to take precedence in athletes' focus, overshadowing positive emotions. Challenges faced by athletes include demanding training and competitive schedules with minimal rest days, frequent travel, external pressures to perform, difficulties with coaches and teammates, conflicts between athletic and academic roles, and insufficient time for non-sport relationships and activities [14][15][16][17][18]. If not properly managed, these challenges can lead to emotional imbalance, with a heightened predisposition toward negativity.

According to Martens et al. [19], competitive state anxiety is intricately linked to the athlete's relationship with a specific competitive situation. Martens et al. further parsed competitive state anxiety into cognitive anxiety and somatic anxiety. Somatic anxiety encompasses the physiological changes experienced by athletes due to anxiety during sports competitions, while cognitive anxiety involves worry, negative thoughts, negative self-esteem, and negative expectations about competition outcomes [20]. Elevated levels of cognitive anxiety lead to diminished performance levels and subpar results, establishing a negative linear relationship between cognitive anxiety and performance. Increased somatic anxiety can enhance performance up to a certain threshold, beyond which the quality of performance starts to decline, even if somatic anxiety continues to increase. Notably, STAI-T scores were significantly higher in the competitive population, indicating a heightened likelihood of elevated stress and anxiety levels compared to the non-competitive population. Smith et al. emphasized the imperative of distinguishing between somatic and cognitive anxiety in relation to anxiety as a trait [21]. Thus, anxiety is a comprehensive term for stress experienced by non-competitive individuals, while in competitive athletes, anxiety is further divided into theoretically beneficial somatic anxiety and detrimental cognitive anxiety.

Despite the heightened responsiveness of the competitive population to emotional stressors, their honed physiology and elevated vagal tone facilitate the maintenance of lower heart rate (HR), systolic blood pressure (SBP), and diastolic blood pressure (DBP) compared to their non-competitive counterparts. Additionally, their cardiac output (CO) and stroke volume (SV) are higher with significantly lower salivary cortisol levels than the non-competitive population. Although an athlete's body may be conditioned to regulate physiological activities, the mind bears the brunt during acute stress. The mind enters a cycle where positive emotions are suppressed, and negative emotions take center stage. This heightened perception of negative emotion renders the individual emotionally sensitive and unstable. Coupled with an athlete's intrinsic perfectionism, this could pose risks to their performance and well-being.

Hence, it is increasingly imperative to integrate mental fitness training alongside physical training for athletes, with a specific focus on tailoring such training for those prone to competitive anxiety. This comprehensive approach can lead to a reduction in cognitive anxiety levels as athletes build confidence and emotional resilience, thereby fostering a linear enhancement in performance and efficiency. In conclusion, our comprehensive exploration of the emotional dynamics among competitive and non-competitive athletes underscores the intricate interplay between stress, performance, and physiological well-being. The heightened sensitivity of competitive athletes to emotional stressors, coupled with their finely-tuned physiology, sheds light on the delicate balance required for optimal athletic functioning.

Conclusion:

The findings reveal a nuanced relationship between cognitive and somatic anxiety, illuminating the impact of these facets on performance outcomes. While competitive athletes exhibit higher susceptibility to negative emotions, their ability to maintain physiological equilibrium, as reflected in lower heart rate, blood pressure, and cortisol levels, underscores the resilience of their trained bodies. However, the psychological toll of acute stress on the athlete's mind, particularly the overshadowing of positive emotions by negative ones, raises critical concerns. The emotional imbalance, exacerbated by external challenges such as rigorous training schedules and conflicting roles, emphasizes the necessity of addressing mental fitness alongside physical training. In light of these insights, a compelling argument emerges for tailored mental fitness programs catering to athletes, especially those prone to competitive anxiety. By fostering emotional endurance, building confidence, and mitigating cognitive anxiety, such programs have the potential to unlock a linear progression in performance and efficiency. As the sporting landscape continues to evolve, embracing a holistic approach that encompasses both physical and mental well-being becomes imperative. The integration of mental fitness initiatives promises not only to enhance athletic prowess but also to safeguard the overall health and well-being of competitive athletes, ensuring a harmonious balance between mind and body in the pursuit of excellence.

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