



PSYCHOBIOLOGICAL PREDICTORS OF EMOTIONAL INTEGRITY IN SOCCER PLAYERS

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ABSTRACT

Purpose of this study was to identify the relationships between different emotional feelings; mood states and associated psychobiological changes pertaining to inner emotional core of promising soccer players of Malaysia. One-hundred and eighteen young male soccer players were recruited on the basis of selection criteria as participants, who were subjected to evaluation of projective analyses of emotionality (in the form of index of emotional integrity); mood states and inner psychobiological status (autonomic indices of habituation paradigm skin conductance response components). Outcomes of multiple linear regression analyses revealed predictive relationships between differential mood variations, the psychobiological and inner core of emotional integrity. Skin conductance indices, such as - tonic component of spontaneous fluctuation (SF) or non-specific skin conductance response (NS-SCR) and phasic component of skin conductance responses such as – amplitude and autonomic recovery were observed to contribute onto the changes observed in the extent of emotional integrity revealed by projective analyses of emotional factor responses. Decomposition of autonomic skin conductance phasic activity indices evidentially substantiated changes in innate psychological make-up, which however was observed to explain affective-motivational aspects of soccer performers.

KEYWORDS: Emotional Integrity; Mood; Skin conductance, Soccer



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1. INTRODUCTION

Soccer being one of the most popular games, elite players are always observed as emotionally resilient. Promising players especially those who are yet to get confirmed place in their respective teams are most likely to get emotionally overloaded, wherein they may not be able to cope with never-ending increased sense of tormenting stress. Researches pertaining to soccer psychology mostly remained focussed onto anxiety-performance relationships¹⁻⁶. Contemporary studies have initiated to pay attention to cognitive interpretation of anxiety and hence studies on coping deficits⁷ and facilitative or debilitating interpretation of anxiety⁸ and emotional make-up as a whole along with psychobiological and cognitive competence⁹⁻¹¹ have been carried out. Though most of the afore-mentioned researches so far were carried out in western set-ups, our previous studies, carried out on elite and promising players of Indian sub-continent^{6,12} and on Malaysian and South-East-Asian athletic population^{9-11 & 13, 14} already hinted upon lack in effective coping skills and detrimental effects of inefficient coping strategies, which led the promising players to face with enormous residual and unresolved tension. Here we also need to point out to the fact that most of the researches dealing with the stress process were carried out following popularly known subjective self-report evaluations methods, which, if not administered following rigorous methodology, are often criticised for self-bias and subjectivity issues. Furthermore, inventories mostly developed and validated on *normotensive* population, cannot be reliably administered to individuals who are supposed to be target-oriented and task-demanding. Facing these situations, we intended to incorporate projective evaluations following standardised methodology and when

obtained data were content analyzed for meaning, as compared to assumptions based on meaning, those were evident to reveal hidden emotional crises and internal conflicts¹³⁻¹⁵. Electrodermal or skin conductance analysis method, on the other hand provides information on autonomic neural responses, which along with both tonic and phasic components can aptly identify subtle psychobiological changes in players^{16,17}. With such a background, a strong need to investigate into the corroborated relationship between psychobiological indices and projective emotionality in explaining soccer performance outcomes was felt. Thus, this study purports –

- To identify the relationship between the mood states and inner core emotionality, if any observed amongst the young soccer players;
- To observe the relationship between habituation components of skin conductance indices and emotional integrity in the young players, and
- To justify the relationship between skin conductance orienting reflex indices, mood states as predictor of emotional integrity.

2. METHODOLOGY

2.1. Participants

One hundred eighteen promising and high performing young male soccer players (age range = 19.7 – 22.9 years) from Malaysia were recruited as participants for this study. They were mostly high-performance trainee soccer players and they were selected unanimously based on their resting Heart rate, VO₂max and their consistent high performance.

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F tests - Linear multiple regression: Fixed model, R² deviation from zero

Analysis: A priori: Compute required sample size

Input:

Effect size f^2	= 0.13
α err prob	= 0.05
Power (1- β err prob)	= 0.80
Number of predictors	= 7

Output: Noncentrality parameter λ = 15.3400000
Critical F = 2.0939133
Numerator df = 7
Denominator df = 110
Total sample size = **118**
Actual power = 0.8016863

(Sample size calculation¹⁸)

2.2. Materials Used

1. Rorschach inkblot test¹⁹ – was administered to evaluate the personality and emotionality of the participants.
2. Brunel's Mood Scale²⁰ was administered for evaluation of mood states and mood valences.
3. Skin Conductance Apparatus (ProComp5 Infinity, USA 2014) – was used to assess the extent of tonic as well as phasic i.e., habituation paradigm component of autonomic regulation as indices of emotionality of the participants.

2.3. Procedure

Participants were soccer players, who were selected on the basis of their consistent high performance by three anonymous coaches, based upon basic soccer skills (e.g.; bilateral shooting ability; square-passing; dribbling; with the ball Zig-Zag Agility running etc.). Once they were selected they were communicated through OPAQUE sealed envelope to ensure blinding of their inclusion in the study. Upon their arrival, and after obtaining the signed consent form, they were guided to the laboratory of the Exercise & Sports Science programme of the School of Health Science, of the Universiti Sains Malaysia. All of the assessments were planned on individual basis, and ample time-interval was kept pre-fixed to avoid any clumsiness in the evaluation procedure. At first they were subjected to assessment of projective evaluation of emotionality (employing the Rorschach Inkblot test) following standard method of administration, in which their task was to watch and observe some colourful cards, and they were supposed to respond to the experimenter about their observation in as far as details as possible. On the basis of the responses obtained from them, inner emotional make-ups of the players were derived. Thereafter they were introduced to evaluation of mood states and mood valences, by employing Brunel's Mood State Scale, in which they were supposed to respond to a structured self-report

inventory containing 24 items. Finally, they were subjected to evaluation of psychobiological indices of emotionality (both tonic and phasic skin conductance assessments were done). On the basis of the scores obtained from the projective analyses of emotionality (employing RIB), measures of emotional core Integrity; feelings of Impulsivity and Irritability were derived. Tonic and phasic Sc (Sc) activity data were decomposed as – basal or tonic Sc; SF or NS-SCR (non-specific Sc response, which is also termed as spontaneous fluctuation or SF); and, phasic Sc, and stimulus-specific orienting response measures (viz. latency; amplitude and recovery time). Skin-conductance habituation paradigm is detailed herewith for better understanding of methodological issues. In this study exosomatic electrodermal or skin conductance activities were recorded and analysed⁸, in which tonic as well as phasic Sc responses were recorded and accordingly were analysed. Nonspecific skin conductance responses (NS.SCRs) were recorded as indices of tonic Sc responses, which occur when Sc changes are observed in the absence of obvious external stimuli¹³. In order to obtain phasic Sc indices, Sc data were collected following habituation paradigm, in which after obtaining tonic Sc data for 5 minutes, participants are provided with white noise (ringing of a bell), which are supposed to evoke EDR or Sc responses. Thereafter the Sc

data were decomposed to obtain, autonomic or ANS peak amplitude or the peak Sc deflection, which can be determined by evaluating the SCR curve to the point of maximum curvature¹⁶. After the event-specific autonomic upsurge reaches the peak, it starts to recuperate and the Sc activity reduces, and the time-taken to reach up to the pre-signal Sc condition is termed as recovery time^{13,16}. The data were treated with SPSS 22.0 for identification of

normality index and wherever required log transformations were done. Thereafter multiple linear regression analyses were done to identify how far the different psychobiological variables and mood states and mood constellations contribute in the shared aetiology of emotional core integrity.

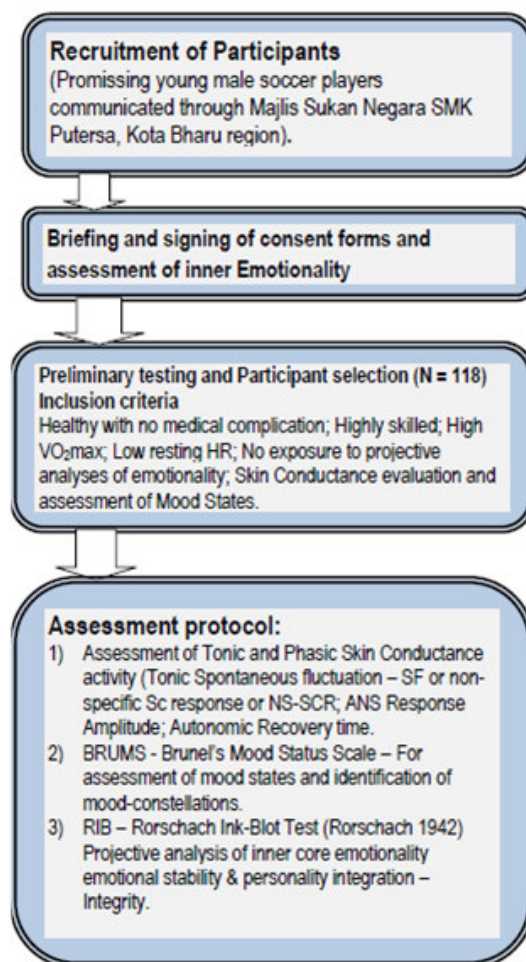


Figure 1 - Flow chart of the experiment

3. RESULTS AND DISCUSSION

Table 1 represented the outcomes of descriptive statistics concerning electrodermal or skin conductance parameters, measures of mood states, mood valences and emotionality, which however revealed that some of the factors had relatively higher inconsistencies in the data.

Table 1
Descriptive Reports on Different measures of Sc parameters; Mood states; Mood valences & Projective evaluation.

Statistics Variables	Skin Conductance – Sc parameters			Evaluation of Mood States		Mood Valences		Projective Evaluation	
	Tonic SF (in no.s)	ANS Amplitude (logMicroSiemen)	Autonomic Recovery time (in Sec.s)	Anger (in scores)	Confusion (in scores)	Vigour (in scores)	Negative Mood	Positive Mood	Integrity (Scores)
Mean	4.12	3.48	10.36	48.13	50.67	53.35	53.12	54.29	3.12
S.D	2.24	1.87	6.13	9.21	11.32	8.56	6.25	9.78	.67

Findings from the multiple linear regression analyses, as represented in the Table 2 (Model a) however explained the relationships existing between emotional integrity and variations in mood observed in the soccer players. Multiple linear regression analyses (Table 3, Model b) were done to identify predictive associations between differential mood states and emotional integrity

observed in the soccer players. Both Models a & b emerged significant, which however explained that variations in mood valences (either positive or negative) and mood states could explain 15.1% and 24.1% of changes in the extent of dependent measure of inner emotional integrity observed in the soccer players.

Table 2
Summary of multiple linear regression analysis when mood variables were assessed.

Model a Dependent Variable – Integrity	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
(Intercept)	16.650	4.481		3.715	.000
Negative mood	-.410	.103	-.457	-3.998	.000
Positive mood	.215	.064	.299	3.373	.001

^a(F (3, 114) = 7.915, P < 0.000)) Model Adj.R² = 15.1%.

Table 3
Summary of multiple linear regression analysis when mood valences were assessed.

Model b Dependent Variable – Integrity	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
(Intercept)	12.411	3.362		3.692	.000
Confusion	-.247	.046	-.458	-5.430	.000
Vigour	.275	.060	.384	4.559	.000

^b(F (2, 115) = 19.543, P < 0.000)) Model Adj.R² = 24.1%.

Table 4
Summary of multiple linear regression analysis when mood variables and skin conductance indices were assessed.

Model c Dependent Variable – Integrity	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
(Intercept)	-7.156	1.712		-4.180	.000
Autonomic Recovery	.086	.010	.934	8.870	.000
Tonic SF	-.481	.065	-.609	-7.353	.000
Anger	-.284	.025	-.604	-11.376	.000
Confusion	-.152	.015	-.574	-9.891	.000
ANS Amplitude	-.136	.022	-.568	-6.194	.000

^c(F (15, 102) = 26.925, P < 0.000)) Model Adj.R² = 76.9%.

Similarly, findings from the Model *c* (refer to Table 4) however explained the relationships existing between emotional integrity and skin conductance indices and differential mood states observed in the soccer players, which however emerged significant, explaining that Sc indices and mood states together could explain 76.9% of changes in the extent of the dependent measure of inner emotional integrity observed in the soccer players. Outcomes from the descriptive data (Table -1) revealed that, the observations based on projective evaluation of emotional integrity were evidentially consistent, which implied that soccer players who were considered as the participants in this experiment, were evidentially more or less consistent in the extent of their inner core emotional integrity. Since projective evaluation of emotionality revealed this unique characteristics prevailing amongst the existing participants, that opened up an opportunity to look into the predictive associations between emotionality and other mood states and concomitant psychobiological indices in acquiring better explanations over psychological regulation during soccer performance. Inconsistent with our previous findings^{11,14}, data from Table 1 however, revealed that the data on Sc components were also free from huge dispersion¹². Hence the data on Sc components partially nullify and go against quite a few of our previous findings which reported about huge discrepancies existing in between tonic and phasic components Sc activities^{1,2,13,3,4}. This finding of relative homogeneity in Sc data could be attributed to the selection criteria of the participants, in which consistently lower resting HR was given priority. Based on the selection criteria of lower RHR and higher extent of VO₂max, for sample size calculation moderate effect size was selected, which might have enabled us to recruit adequately large sample having homogeneous autonomic characteristics. Apart from this, observed homogeneity in Sc data could also be explained in terms of relative role of respiratory sinus arrhythmia which is guided by enhanced vagal tone²⁴, as vagal complex, in fact vagal brake as proposed by Porges²⁵ in his Polyvagal theory and subsequent research documents, could be

attributed as a valid explanation of sympathovagal balance and concomitant skin conductance regulation observed in the players. Findings of the prediction analyses (represented in the Tables 2, 3 & 4) however, suggested that the inner unconscious core of integrity in the participants derived out of the findings from the projective analysis was aptly predicted by mood states and mood variations and also by psychobiological autonomic indices. Table 2 depicts the model *a*, which emerged significant implying the fact that lower extent of negative mood facilitated in enhanced integrity in the players, and if the facilitative impact of reduced negative mood is regressed or controlled for emotional integrity, those who had higher extent of positive mood, evidentially had better integrity. Similarly, Table – 3 (model *b*) clarified that those who had lesser extent of confusion were having higher integrity, and if that impact of lower confusion is controlled for, those who were observed as having higher extent of vigour, were observed as having high extent of integrity. Finally the Model *c* (table 4) represented that corroborative impact of psychobiological competence and mood regulation had significant impact onto enhancement in emotional integrity. The model explained 76.1% of variance changes in the extent of inner emotional integrity. In-depth analyses however revealed that delayed autonomic recovery was facilitative for improvement in integrity, which seems unlikely, since faster recovery from autonomic stress have always been highlighted as precursor for heightened emotional regulation^{6,10-14,16,17}. This could have perhaps happened for the reason that, participants did neither have frequent tonic SF (NS-SCR) nor heightened ANS amplitude, which implied that they didn't have startling autonomic response, and the habituation paradigm Sc activity was not at all heightened, and hence a delayed recovery from resultant ANS arousal could be considered as characteristic feature of South-East Asian participants, who are mostly characterized as having reluctant approach to life and social existence^{9,10,23}. Further scrutiny onto the outcomes of Model *c* however also clarify that, apart from the dominant predictive influence of

autonomic indices, relatively lower extent of anger and confusion observed in the players were also beneficial for them to enjoy enhanced level of emotional integrity. Present findings of corroborative contribution of Sc indices and mood variables in facilitating changes in emotionality, got adequate supported by the findings obtained by previous

researchers^{6,9,11,12,16}. Finally, summary of present discussion would like to hint upon the vital role of feeling, of confusion and negative mood along with adequately flexible and competent autonomic phasic or event-related adaptation could aptly regulate inner core emotional integrity observed in the soccer players.

4. CONCLUSION

Hence, on the basis of the above findings, it is concluded that -

- Both negative and positive mood states were observed to be associated with emotional integrity observed in the soccer players.
- Lower extent of confusion and higher level of feelings of vigour were also observed to be associated with emotional integrity evident in the players.
- Tonic startle response and phasic skin conductance activities, such as amplitude and recovery along with lower extent of anger and confusion, were found to be the key predictors of changes in emotional integrity.

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