Int J Pharm Bio Sci 2015 April; 6(2): (B) 559 - 565

Research Article **Allied science**

International Journal of Pharma and Bio Sciences **ISSN 0975-6299**

SKIN CONDUCTANCE PREDICTORS OF FEELINGS OF IRRITABILITY IN THE ATHLETES

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ABSTRACT

Present study was undertaken to identify the confounding associations between mood disorders and concomitant psychobiological precursors of inner emotional hindrances observed in high performing athletes of Malaysia. Altogether one-hundred nine male young competitive athletes young competitive athletes volunteered as participants, who were subjected to evaluation of projective analyses of emotionality (in the form of indices of irritability and suspicion); inner psychobiological status (autonomic indices of tonic and phasic skin conductance response habituation paradigm components). Findings of multiple linear regression analyses revealed corroborative relationships between differential psychobiological and inner feelings of suspicion in predicting inner core emotionality. Different Sc indices, such as - tonic and phasic components of skin conductance activity were found to contribute onto the changes observed in the extent of feeling of irritability. Corroborative psychophysiological markers for innate psychological make-up was attempted to be established as differential models in multiple linear regression analyses suggested varied ranges of direct, inverse and supportive relationships between decomposition of autonomic orienting activity components related to affective-motivational aspects of sports behaviour.

KEYWORDS: **Skin conductance, Irritability; Athletes**

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1. INTRODUCTION

In the field of sport and athletic affairs, for the inherent nature of uncertainty involved, performance pressure seems all-encompassing and most of the budding athletes remain unaware of that overwhelming crisis until when they come across any challenging competitive demands. These inhibiting experiences lead to feelings of apprehensions concerning performance deficits. In absence of planned and organised psychological skill training programmes, majority of the young athletes in their formative stages grow up with perceived feelings emotional overloading wherein they cannot cope with never-ending increased sense of trauma and tormenting stress. Our previous studies on similar population[1,2,3,4] have already hinted upon this core issue of lack in effective coping skills and how the inefficient coping strategies leave the promising sport performers with enormous residual and unresolved tension. As researches on stress process became obvious, optimal and valid evaluation of emotional crises became the most pertinent issue of concern. Popularly known methods of evaluations pertain to subjective self-report evaluations, which, if not administered following rigorous methodology are often criticised for the opportunity for deceit, either deliberately or unconsciously. Apart from that, those inventories do not leave ample option to express all aspects of a personality trait when only a yes or no answer can be given. Further to that, mostly those tests are developed and validated based on the *normo-tensive* population, and are not reliably constructed controlling all or at least majority of the possible subject-relevant and situation- relevant and cross-cultural confounding factors. In resolving these crises, projective evaluations could be opted for, which if administered following rigorous methodology and the reports are content analyzed for meaning rather than being based on presuppositions about meaning, can reveal hidden emotional crises and internal conflicts[5]. As responders cannot have any personal bias, and hence cannot regulate the outcomes of projective evaluations, outcomes of psychobiological evaluations also cannot be manipulated and hence if utilised properly, based on corroborative objective as well as valid etiological information, can provide with vital information concerning cognitive-emotional processes underlying and behaviour pathology occurring in the field of sports[6,1,2,4,7].The skin conductance method captures the autonomic nerve response as a parameter of the sweat gland function, and if decomposed (with both tonic and phasic components) appropriately can identify any subtle change following slightest environmental changes[8,6]**.** With such a background, we wanted to investigate into the substantiated relationship between psychobiological components and projective evaluation of emotionality to examine the aspects of upheaval emotionality in young adolescent athletes. Internalised or deep-seeded anxiety leading towards apprehensions of loosing if accompanied by feelings of suspicion can lead to intense feelings of frustration, which is susceptible to put tremendous detrimental effects onto competitive performance, and hence our attempts would be to identify a corroborative relationship between the inner psychological processes and psychobiological explanations to behavioural aetiology. Thus, this study purports –

- To identify the relationship between the autonomic indices of emotionality along with the projective analysis of emotionality, if any, in the young adult athletes;
- To see the relationship between habituation component of skin conductance indices and emotional feelings of suspicion in the young adult athletes, and
- To justify the relationship between skin conductance orienting reflex indices and emotional feelings of suspicion as predictor of feelings of irritability.

2. METHODOLOGY

2.1. Participants

One hundred nine consistently high performing young male athletes (age range = 18.4 – 23.6 years) from Malaysia were recruited as participants for this study. They were mostly high-performance trainee athletes and they were selected unanimously based on their resting

Heart rate and their consistent high performance.

[1] -- *Tuesday, January 13, 2015 -- 16:26:25*
F tests - Multiple Regression: Omnibus (R^2 deviation from zero)
Analysis: A priori: Compute required sample size

Input:	Effect size f^2	=	0.15
	α err prob	=	0.05
	Power (1-β err prob)	=	0.80
	Number of predictors	=	8
Output:	Noncentrality parameter λ	=	16.3500000
	Critical F	=	2.0323276
	Numerator df	=	8
	Denominator df	=	100
	Total sample size	=	109
	Actual power	=	0.8040987

(Sample size calculation[9])

2.2. Materials Used

1. Rorschach inkblot test[10] – was administered to evaluate the personality and emotionality of the participants.
2. 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

All of the participants upon arrival at the laboratory of the Exercise & Sports Science programme of the School of Health Science, of the Universiti Sains Malaysia were at first subjected to assessment of projective evaluation of emotionality (employing the Rorschach Inkblot test) following standard method of administration. 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), emotional measures of feelings of Suspicion 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.

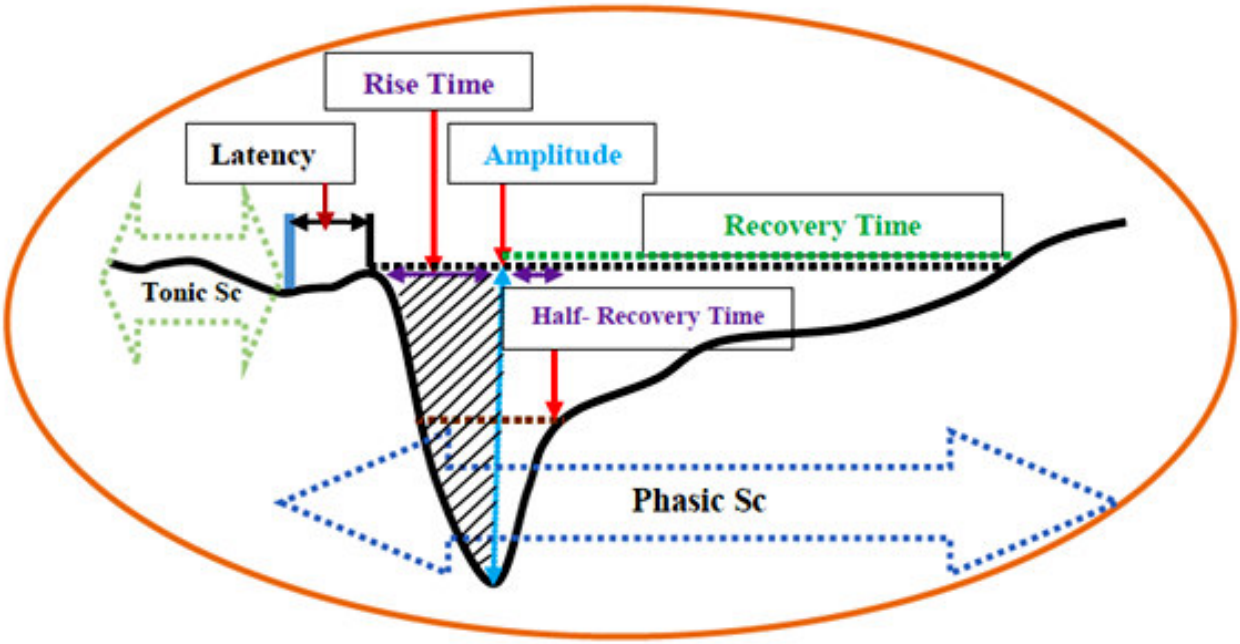

Figure 1 - Skin Conductance (Sc) Habituation Paradigm

In this study exosomatic Sc activities are recorded and analysed[8], in which tonic as well as phasic Sc responses were recorded and accordingly were analysed. Basically there are two most important measures of tonic Sc or electrodermal (EDA) states (in the fig. 1 it is exemplarily represented as green-colured & dotted double-sided arrow): skin conductance level (SCL) and nonspecific skin conductance responses (NS.SCRs) or nonspecific EDRs (NS.EDRs) when Sc changes occur in the absence of obvious external stimuli. SCL is characteristically expressed in microsiemens units, but usually in order to normalize the data; those are often transformed to log SCL. Brief and sometimes short-lived changes in Sc responses if elicited by any pre-fixed or distinct stimulation falls under the terminology of phasic Sc (in the fig. 1 - represented as blue-colured & dotted double-sided arrow), which characteristically is also called as event-related SCR[6,8], which initiates by a *latency* in response to stimulation (fig. 1 -marked by a blue line – as marker to denote onset of stimulation) and which is determined in seconds. Usual range for SCR latency is reported as ranging from 1 to 4 s after a stimulus change (either onset or offset), considering the fact that, certain amount of time is required for processing the stimulus, autonomic nervous system nerve conduction to the sweat glands, and penetration of sweat through the ducts to the epidermis. Thus *latency* is referred to the time delay for onset of a response, which may need to take some time to reach or rise up to the peak – and hence this time-delay is termed as *rise time* (fig. 1 - marked by stripped lines to denote the time-delay to reach the amplitude up to the peak) which may range from 1 – 3 sec.s[6,8]. The autonomic Sc response followed by stimulation is referred to as *amplitude* which can be determined by evaluating the SCR curve to the point of maximum curvature (fig. 1 – marked by the blue line to denote the peak amplitude) and, the minimum amplitude may vary across studies from 0.01 to 0.05 µS[11,8] and based on the findings of Dawson and his co-researchers[7], it may have a range of 0.2 – 1.0 µS. Finally after having data for amplitude or the peak Sc deflection, recovery from the sudden autonomic upsurge begins, that is, the electrodermal reading starts to decline in the

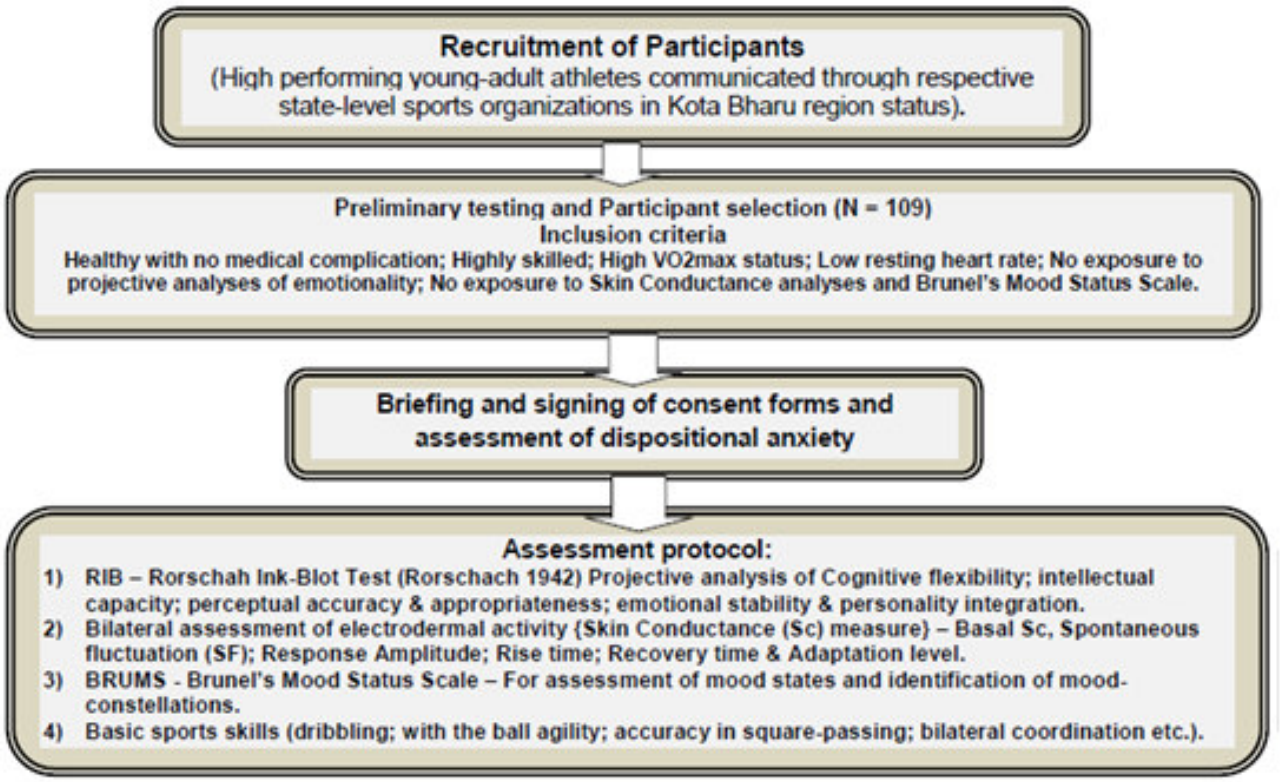

Figure 2 - Flow chart of the experiment

direction of the initial Sc status before the response. Time taken to recover from the increased Sc, is known as *recovery time* (fig. 1 – marked by green dotted lines to denote the recovery time to reach back to the baseline). However, total recovery from Sc peak amplitude usually doesn't happen quickly, EDRs mostly do not quickly reach the level from which they started, since the sweat elicited by raised Sc amplitude increases the moisture of the corneum and thus the SCL (wet corneum is more conductive than dry corneum) or the duct empties slowly or both. Thus, it is predicted that only a portion, perhaps half of the amplitude will be "recovered" and hence for this probable incomplete recovering process, recovery is measured as half-time recovery or half-recovery time or 63% recovery (fig. 1 – denoted by brown dotted lines to indicate the half-recovery time to reach back to the baseline) which is measured in seconds, and as far as it is suggested, half-recovery time could vary from 2 – 10 sec.s[6]. The data were treated with SPSS 22.0 for identification of normality index and wherever required log transformations were done. Thereafter multiple linear regression analysis was done to identify how far the different psychobiological variables contribute in the shared aetiology of emotional feelings of irritability.

3. RESULTS AND DISCUSSION

Table 1 represented the outcomes of descriptive statistics concerning psychobiological parameters and measures of emotionality, which however revealed that some of the factors had higher inconsistencies in the data.

Table 1
Descriptive Reports on Different measures of Sc tonic and phasic component measures

Statistics \ Variables	Psychobiological (Skin Conductance – Sc) parameters								Projective Evaluation	
	Tonic Sc (MicroSiemen)	Tonic SF (in no.s)	Tonic Adaptation (MicroSiemen)	Phasic Sc (MicroSiemen)	Phasic Adaptation (MicroSiemen)	Latency (in Sec.s)	Amplitude (MicroSiemen)	Recovery time (in Sec.s)	Irritability (Scores)	Suspicion (Scores)
Mean	17.69	2.30	-9.44	16.64	-7.38	1.75	6.16	16.03	1.92	5.74
S.D	13.38	2.58	3.10	11.78	5.82	1.73	7.99	20.23	.52	2.11

Result from Table 2 however explained the relationships existing between different Sc parameters in explaining their relative contributions on the extent of changes observed in the feeling of irritability observed in the athletes. Multiple linear regression analyses (Table 3, Model *b*) *were* done to identify predictive associations between Sc indices of emotionality as well as emotionality evaluated by projective analyses. Model *b* emerged significant, which however explained that if suspicion as the inner emotional feeling is controlled for the feeling of irritability, the psychobiological tonic and phasic component indices together could explain 37.6% variance of changes in the extent of emotional feeling of irritability. Findings from the Table -1 revealed that, the observations based on projective evaluation were evidentially consistent, since what is

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

Model *b* Dependent Variable – Irritability	Unstandardized Coefficients		Standardized Coefficients			Correlations Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
(Intercept)	.832	.363		2.292	.023					
Suspicion	.120	.051	.156	2.357	.019	.272	.164	.129	.684	1.461
Tonic Sc	.003	.001	.170	2.479	.014	-.109	.172	.135	.637	1.570
Tonic Adaptation	.032	.004	.529	7.385	.000	.362	.461	.404	.581	1.721
Phasic Adaptation	-.039	.006	-.443	-7.108	.000	-.264	-.447	-.388	.768	1.301
Latency	.206	.082	.185	2.507	.013	.152	.174	.137	.549	1.822
Amplitude	.075	.022	.325	3.372	.001	.018	.231	.184	.322	3.109
Recovery	-.036	.008	-.388	-4.304	.000	-.077	-.290	-.235	.367	2.728

[b](F (7, 101) = 18.989, P < 0.000)) Model Adj.R2 = 37.6%.

actually expected, both the feelings of suspicion and irritability observed amongst the participants did not have huge dispersion[12]. For the psychobiological (Sc) parameters, as it was supposed, observations however were found to have huge deviations from each other[6]. Similar studies carried out by us in similar experimental set-ups also confirmed identical extents of discrepancies existing in between tonic and phasic components Sc activities[1,2,13,3,4]. Usual practice after the Committee Report on Publication recommendations for electrodermal measurements[8] advised, Sc data were log transformed to rectify the inconsistencies and the range of data followed the recommended ranges prescribed by Dawson and his colleagues[6]. Findings of the prediction analysis, however, suggested that the emotional feelings from the inner unconscious core of irritability in the participants indexed from the projective analysis were aptly predicted by emotional feelings of suspicion and psychobiological autonomic indices. Table 2 depicts the model ***a***, which emerged significant implying the fact that if the facilitative impact of inner feelings of suspicion is regressed from the extent of feelings of irritability, the autonomic measures of tonic Sc; Tonic & phasic Sc adaptations; latency; amplitude & recovery time could explain 37.6% variance of changes in inner emotional feelings of irritability. That means, if the observed facilitative effect of feelings of suspicion is controlled for or hold constant (i. e., remains unchanged), participants who were evident with relative lack of psychobiological competence had lower regulation of inner feelings of irritability. Close scrutiny of Beta coefficients signify that, irrespective of the contributory impact of all other Sc variables, every 1% improvement in Tonic adaptation will lead to .529% (refer to the beta coefficient of Tonic Adaptation, as in psychological and psychobiological research, standardized coefficients are considered) of corresponding reduction in feelings of emotional irritability. Present findings of corroborative relationship found adequately supported by Dawson and his colleagues[6] and Saha and his coresearchers[1,2,3,7]. Apart from that the model also explained the inhibitive impact of the Phasic Sc Adaptation (tolerance was 76.8%) on feelings of irritability. This corroborative relationship between the psychobiological competence and inner psychological phenomena seemed in line with the previous researches done from same research institute[1,2]. Finally, summary of present discussion would like to hint upon the vital role of feeling, of suspicion and if it is controlled for, efficiency in autonomic phasic or event-related adaptation could aptly regulate inner feelings of irritability observed in the athletes, and optimal relieves from emotional core irritability would be off great help to them.

4. CONCLUSION

From the findings of the study, it is concluded that

- Autonomic indices of emotionality were observed to be associated with emotional

feelings of suspicion in predicting changes in the feelings of irritability in the athletes.

- Emotional measures, such as suspicion and irritability were also observed to be associated with habituation components of skin conductance indices, such as – latency, amplitude and recovery.
- Both tonic and phasic skin conductance adaptations were found to be the key predictors of changes in the feelings of irritability.

5. ACKNOWLEDGEMENT

Corresponding author Dr. Srilekha Saha was supported by a Fundamental Research Grant Scheme (FRGS) Ministry of Education, Govt. of Malaysia research grant (203/PPSK/6171159). Authors of the present study are indebted to the Grant Authorities for having awarded to carry out the study.

Conflict of Interest

Conflict of interest declared none.

6. REFERENCES

1. Saha, S., Mukhopadhyay, Pritha., Chattopadhyay, P. K., Biswas, D., and Saha, Srilekha. Arousal modulation as predictor of achievement motivation in high soccer performers. Reading in Sports Psychology: Jitendra Mohon and Meena Sehgal (Eds.) Friends Publications, India, 116-146, (2005).
2. Saha, S., Saha, Srilekha., Chowdhury, D., Fahim, N. A and SalahUddin, M. In search of predictors for reaction ability related to high performance in Cricket: Social Science International, 28 (1), (2012a), 1 – 18.
3. Saha, S., Saha, Srilekha. and Asyraf, B. R. Corroborative psychobiological indices explaining young adolescent emotionality: Procedia Social and Behavioural Sciences, 91, (2013c), 614 -623.
4. Saha, S., Saha, Srilekha., Zahir, and N. E. B. M. Significance of Orienting Reflex on Emotional Resilience in Explaining High Performance in Soccer Players: International Medical Journal, 21(5), (2014), 459 – 462.
5. Cordón, L. A. *Popular psychology: an encyclopedia*: Westport, Conn: Greenwood Press. (2005), 201–204.
6. Dawson, M. E, Schell, A. M, and Filion, D. L. The electrodermal system. In: Cacioppo JT, Tassinary LG, Berntson GG, (Eds.), Handbook of psychophysiology. Cambridge: University Press; (2007), 159–81.
7. Saha, Srilekha, Ahmed, M., Huda, Foujia, Zahir, N. E. B. M, Ibrahim, N. F. and Saha, S. Impact of differential biofeedback interventions on autonomic habituation and fatigability in soccer players: Int J Pharm Bio Sci, Jan, 6(1), (b), (2015), 969 – 976.
8. Boucsein, W., Fowles, D. C., Grimnes, S., Ben-Shakhar, G., Roth, W. T., Dawson, M. E. and Filion, D. L. Society for Psychophysiological Research Ad Hoc Committee on Electrodermal Measures: Committee Report - Publication Recommendations for Electrodermal Measurements. Psychophysiology, 49 (2012), 1017–1034.
9. Faul, F., Erdfelder, E., Lang, A.-G., and Buchner, A.. G*Power 3: A flexible statistical power analysis program for the social, behavioural, and biomedical sciences: Behaviour Research Methods, 39, (2007), 175-191.
10. Rorschach, H. Psychodiagnostics. (English translation of Psychodiagnostik.) N. Y., Grune & Stratton. (1942).
11. Boucsein, W. Electrodermal activity: New York: Plenum, 1992.
12. Evans, F. B. Introduction to Practice Matters Special Section on the Rorschach: Psychol. Inj. and Law, 5, (2012), 95–96.
13. Saha, S., Saha, S., Krasilshchikov, O. and Ismail, Mohd. S. Impact of Accuracy in Anticipation on Decomposition of Autonomic Tonic and Phasic Responses as Predictor of Performance Excellence in Malaysian Swimmers. Athens: ATINER'S Conference Paper Series, (2012) No: FIT2012-0273, 1 – 19.