

Addendum to general GSR methodological profile: sexual health, pathology and response analysis via primary GSR with secondary and tertiary variables.

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Abstract:

Please recall the foregoing conclusions and analyses which have detailed the specific neuroanatomical activations and emergent sympathetic and parasympathetic connectivities including the inter-connective limbic and Orbito-Frontal Cortex (OFC) circuit pathways spanning the deepest psychological foundations and encoding on both conscious and unconscious levels, which may be revealed in GSR (Norman and Conte et al. 2016). The very deepest psychological factors springing from fundamental neuro-affective regulatory agencies may be assessed and measured. This vital work will be performed so as to aid and assess both individuals and couples who are dealing with sexual dysfunction using measurement of response to salient libidinal stimulus and resultant signal analysis. The quality of emotional content and symptom specific affective distributional signal components will be measured. Such work is no simple matter, and may well be substantially aided and sharpened through the addition of secondary variables such as Heart Rate (HR) and Heart Rate Variability (HRV), which just as GSR, demonstrate nonlinear characteristics. Tertiary variables are also discussed as they will aid the process of informational distillation. To gain access to the embedded information, a full and substantial knowledge across the disciplines of neuroscience, psychology, psychiatry, linear and nonlinear mathematical physics is required. Non linear and linear analysis of component interactive dynamics in the GSR signal must be interpreted in accordance with the previously specified methodological framework.

In Conclusion :

1) THE MONITORING OF THE GSR AND ITS SUBSEQUENT ANALYSIS BY LINEAR AND NON LINEAR METHODS IN SUBJECTS EXPOSED TO SEXUAL STIMULI IS OF BASIC IMPORTANCE TO CHARACTERIZE HIS/HER SEXUAL AROUSAL AS INTERPRETED WITHIN THEIR COMPLETE ORGANIC AND PSYCHOLOGICAL PROFILE.

2) THE SIMULTANEOUS USE OF HR (HRV) RECORDING WITH GSR WILL YIELD RESULTS OF BASIC IMPORTANCE AS DURING EXPERIMENTALLY CONTROLLED STIMULUS, COUPLED AND SYNCHRONIZED ANALYSIS OF THE PEAK PHASE OF THE GSR AND DECREASING (RESPECTIVELY INCREASING) HR, ENABLES US TO CHARACTERIZE THE EMOTIONAL/AFFECTIVE TYPE AND STATE OF THE SUBJECT.

RELATION

Why use GSR to probe the human sexual conundrum? The matter is complex, and the two sexes do not fit the same mold (Benson, 2003). Many studies have led to a series of contradictory, or at least overly complex results. It appears to use some measures of physical arousal such as vaginal blood flow, that women are able to generate evidence of excitation to more diverse stimuli than men (Chivers and Bailey, 2005). But to use other measures, such as specific clitoral excitation evidenced through the clitoral photoplethysmograph, female responses are revealed as more specific (Gerritsen et al. 2009).

In the case of the female, invasive means such as the *vaginal photoplethysmograph* (Geer, 2005), or in the male case the familiar *penile plethysmograph* must be used to gauge excitation. The *clitoral photoplethysmograph* does seem to have some specific measure of inhibition associated with its functional output (Gerritsen et al. 2009), but the device is physically invasive exactly as the others used, which include but are not limited to:

Vaginal Photoplethysmography, the Xenon-133 Washout and the Oxygen-Temperature method involving injection of a tracer intraepithelially in the posterior vagina, along with a vaginal suction cup holding a heated electrode, Vaginal and Labial Thermistors, Clitoral intracavernosal pressure measurement using a catheter inserted into clitoral cavernosal tissue, Pelvic Floor Electromyogram techniques using stainless steel wire electrodes and silver disc electrodes attached to the vaginal wall, and a host of other methods (Woodard and Diamond, 2009).

Clearly GSR is less invasive than many of the other methods offered. However, on the

surface it appears to be less specific. We assert: This is not so, and this false impression is due only to the fact that the highly complex nonlinear signal has not been properly analyzed within a modern multidisciplinary understanding of the appropriate mathematical techniques. Now, we are in a position to discover and make use of the embedded information contained in the GSR signal in the light of psychology and neuroscientific advancements applied within a proper model of linear and nonlinear analysis. This new approach to GSR will unearth the full potential of this safe, noninvasive diagnostic tool and demonstrate that it is capable of dynamic and precise systemic assessment. GSR measurement is a practical technique which will allow the detailed quantization of emotional and sexual aspects *as they interact* in the context of functional affective regulation, so as to yield a complete picture of the complexities of sexual functioning, regulation, and subjective experience.

From psychology and neuro-anatomy to functional analysis:

Sexuality is not a simple matter of excitation and pleasure for the purpose of procreation. The modern human is a highly complex, socially bound and convoluted animal and his/her resistances to internal drives and thoughts are as important as those drives themselves in assessing the situation of human sexual health and happiness (Freud, 1886-1939). GSR once psychologically contextualized within the mathematical interactivity of secondary linear and non linear variables like HR and HRV, will open a window into the specific hidden processes of resistance, excitation and energetic expenditure which are human sexuality, pathology and health.

Women often demonstrate conflicted and oppositional physiological and subjective aspects of sexual excitation (Castaneda, 2013 pp. 257–260). We deduce psychologically: Somatic (unconscious) indications of excitation are often paired with disgust or other subjective (conscious) reactions. This familiar process of reaction formation and repression of an ego dystonic drive/element, indicative of affective control and restriction, is demonstrated in female GSR responses to erotic material. In (Costa and Esteves, 2008) pertaining to the lack of previously predicted lateral distributions of female GSR response to erotic content we read: “. . . women are more able to control and inhibit emotions, inclusively sexual arousal . . . and regulatory control of sexual and emotional responses seems biased to the left hemisphere Thus larger left SCRs during the erotica exhibition could have reflected in part regulatory processes by left hemisphere structures, associated with voluntary regulation (or inhibition) of sexual emotions. . . . Moreover, dysregulation of otherwise adaptive inhibitory mechanisms might contribute to sexual dysfunction . . . ”

GSR captures both expressed dynamic libidinal drive elements, and their inhibition and repression.

The complexity of the specific operational intersection between neuroanatomy, somatic response and basic unconscious arousal as captured by GSR has now been articulated in deep detail. In a cursory way we may summarize the information as follows (see:) (Costa and Esteves, 2008): Sexual excitation is associated with areas which control GSRs.

Penile tumescence induced by viewing erotic material is associated with elevated activity in cingulate gyrus, insula, right anterior cingulate cortex and right thalamus, anterior cingulate gyrus, amygdala, and hypothalamus. Female orgasm is associated with hypothalamus, hippocampus, anterior cingulate gyrus, insula, and amygdala activation. Generally: fMRI studies indicate response to erotic material from anterior cingulate gyrus, insula and amygdala for both men and women, along with thalamus and hypothalamus for men. During orgasm in men right prefrontal activation is indicated and erotic material increases activation in the bilateral (mostly right) extrastriate cortices and right inferolateral prefrontal cortex, anterior cingulate gyrus and hypothalamus (Costa and Esteves, 2008).

In order to untangle the interwoven complexity of excitation and restriction of affective expression endemic to the moral complexities and physical needs of patients, GSR phasic signal relations are key as they clearly contain within them the result of those highly complex interactions detailed above. The problem then, is to ascertain exactly how to interpret the information so as to extract and detail the current operational state of the patient's fluid human mental dynamic. In order to do so, it will be helpful to add a second nonlinear component, such as HR, HRV, or perhaps also concurrent EEG in order to further refine the affective signal structure to be identified (Wang, Liu and yang 2008). It is possible to extract the full potential of this technology through dissipative/conservative systems GSR signal analysis (Basak et al. 2005) within a concurrent linear and non linear mathematical approach which is psychologically and neuroscientifically contextualized. Indeed, such linear and non linear analysis is the precise specialization of our group [references sharply abbreviated] (Conte and Lucas 2015; Laterza, Todarello and Conte, 2013; Conte, 2012; Conte et al. 2009; Conte et al. 2004).

Tertiary analytic methodologies:

Due to the longstanding commitment of our group to the pursuit of specific mathematical tools and approaches to unearth the deep intersection between mentation, health and inherent nonlinear/chaotic process dynamics, we may offer further empirical and practical insight in order to further sharpen the picture. The very repetition compulsion itself which constitutes the fundamental unconscious resistance to change may be attributed a sort of fixated fractal structure, just as the interpretation of dreams, health and pathology may be assessed in terms of the trend toward or away from the constructive evolution of self-similar complexity (Conte et al. 2008). Indeed, direct analysis of unconscious structures mediating peak experiences demonstrate clear fractal aspects (Norman, 2014).

Our group was the first to use fractal analysis to gauge subjective aesthetic assessment of Rorschach ink blots, relating specific mathematics to human subjective and affective judgments (Conte et al. 2008). In fact, starting in 2011, our group performed routine monitoring and subsequent linear and non linear analysis of GSR using Rorschach ink blots as the input stimulus. This tertiary insight actively and directly applied in tandem with simultaneous primary and secondary signal analysis will unearth the fundamental state of balance and pathological constituency of the subject to be aided.

In consideration of these insights our group is best suited to advance a complete psychologically, neuroscientifically grounded mathematics, capable of using primary GSR, in conjunction with secondary linear/nonlinear component measures such as HR/HRV and EEG, to be further augmented in the addition of tertiary fractal and multi fractal analysis of perceptive processes, so as to unearth the health and functional state of human psychopathology. In this way, we might best offer tangible and specific aid to the patient population in need of analysis and subsequent rightly directed treatment.

Conclusion:

Sexual health in the human animal is a highly complex and detailed interactive phenomenon which spans many brain regions and somatic targets, yielding a delicate balance between inhibition and expression. The same component areas which create this complex dynamic, are those which demonstrably affect GSR. GSR, alongside concurrent non linear analysis of other signal sources such as heart rate (HR) heart rate variability (HRV) and EEG, if properly interpreted within the correct experimental and mathematical methodology, may then derive deep insight into conscious and unconscious dynamics and so, aid in patient taxonomy while pointing up highly specific avenues of therapeutic approach.

Next in this series, we will relate common sexual pathology and dysfunction to the social factors which exacerbate this problem, and then, offer a potential safe therapeutic solution, as well as a method to test its efficacy while establishing a nonlinear GSR socio-affective metric.

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