Because λ is a positive real number, then α(λ) can be interpreted as P_r(a planned outage occurs when the system is in the working state) . The complementary probability,1-α(λ) , is P_r(working system has an unplanned outage). Then α (λ) has the properties:
1) If $\lambda_1 > \lambda_2 > 0$, then $\alpha(\lambda_1) < \alpha(\lambda_2)$: α(λ) is a monotonically Decreasing function;

2) $\alpha(0) = 1$, $\alpha(\infty) = 0$,$0 \leq \alpha(\lambda) \leq 1$.
It follows that θ(λ) is also a monotonically decreasing function of λ.

Now, the Availability formula for the distribution of TTP is deterministic
Let TTP = T,

$$A_D(T) = [\ 1+\frac{\lambda}{\mu}+\frac{\lambda}{\mu_2}\cdot\frac{\exp(-\lambda.T)}{1-\exp(-\lambda.T)}\ ]^{-1}$$

$$= [\ 1+\frac{\lambda}{\mu}+\frac{\lambda}{\mu_2}\cdot\frac{1}{\exp(-\lambda.T)-1}\ ]^{-1}$$

also,let TTP Є [T_1,T_2](0< T1<T2);the pdf of TTP is defined in such a way that f(x) =0,for x not in [T_1,T_2] and $\int_{T1}^{T2} f(x)dx = 1$.

Let A_B(T_1 ,T_2) be the system availability, with a distribution of TTP bounded in
[T1,T2]. Hence, the availability bound for the deterministically distributed outages is,
$A_D(T_1) \leq A_B(T_1, T_2) \leq A_D(T_2)$, $0 \leq T_1 \leq T_2$.

3. Application

A history of early-life abuse or neglect appears to increase risk for mood and anxiety disorders. Abnormal HPA response to stress challenge has been reported in adult patients with Major Depressive Disorder and Post-Traumatic Stress Disorder. Cortisol dysregulation and deficient glucocorticoid feedback regulation have been identified as biological correlates of adult depression and anxiety disorders, and early life adversity is consistently associated with these disorders in epidemiological studies. A large body of clinical literature has characterized major depressive disorder (MDD) [1] as a condition associated with excessive basal Cortisol secretion and inadequate inhibitory feedback regulation of the hypothalamus-pituitary-adrenal (HPA) axis constituents [4, 5]. Conversely, relatively low basal Cortisol concentrations, low awakening Cortisol response, and enhanced Cortisol suppression following low-dose dexamethasone administration have been suggested as correlates of Post-Traumatic Stress Disorder (PTSD). Childhood maltreatment, another risk factor for depression, has recently been examined in nonclinical samples. Women with a history of sexual or physical abuse demonstrated increased ACTH but normal Cortisol responses to the TSST when compared with female control subjects without abuse histories. Compared with CTLs, MAL subjects a significant group effect was seen in the Cortisol response to the stress challenge, reflecting lower concentrations among MAL subjects and also a significant group × time effect characterized the relatively blunted ACTH response of the MAL group. Emotional Neglect and Sexual Abuse strongly predicted maximal Cortisol release[6,7,8].

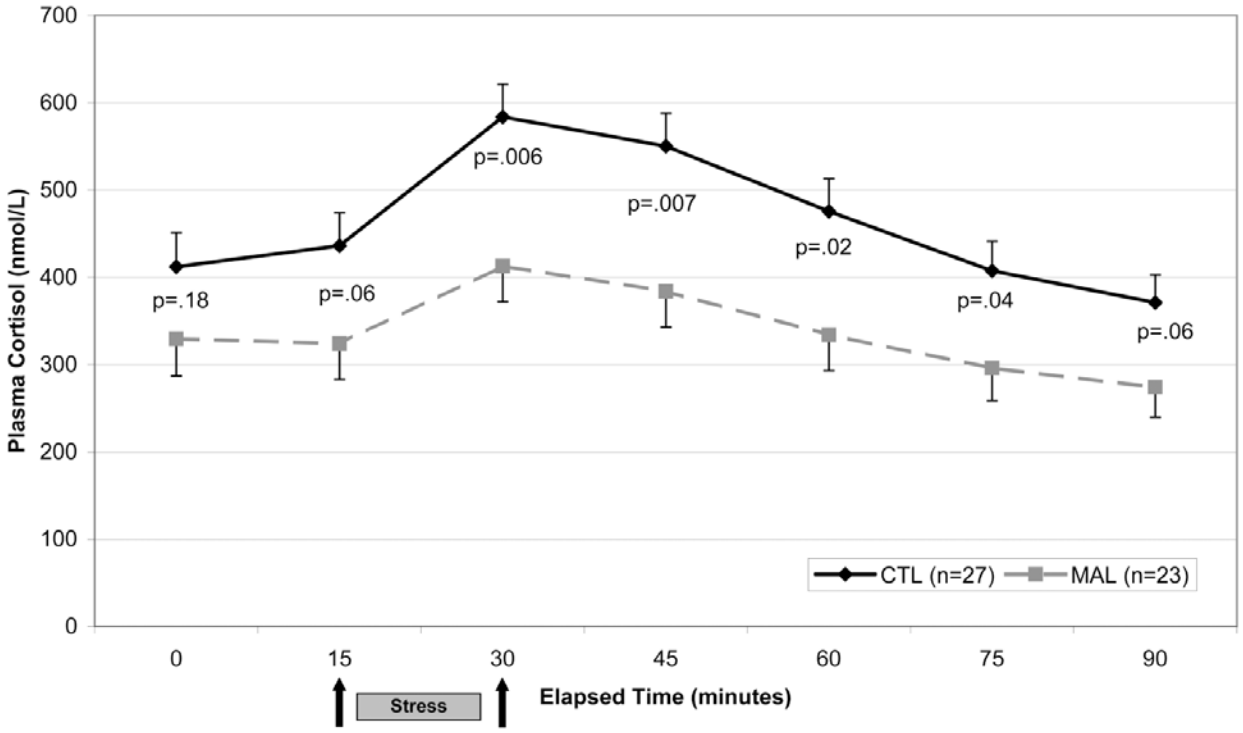


Figure 1: Plasma Cortisol response to Trier Social Stress Test in Healthy Adults with (n=23) and without (n=27) a history of childhood maltreatment. A significant main effect of group is present F=5.9 [1], p=.02. P-values reported on the graph represent group differences at individual time points.

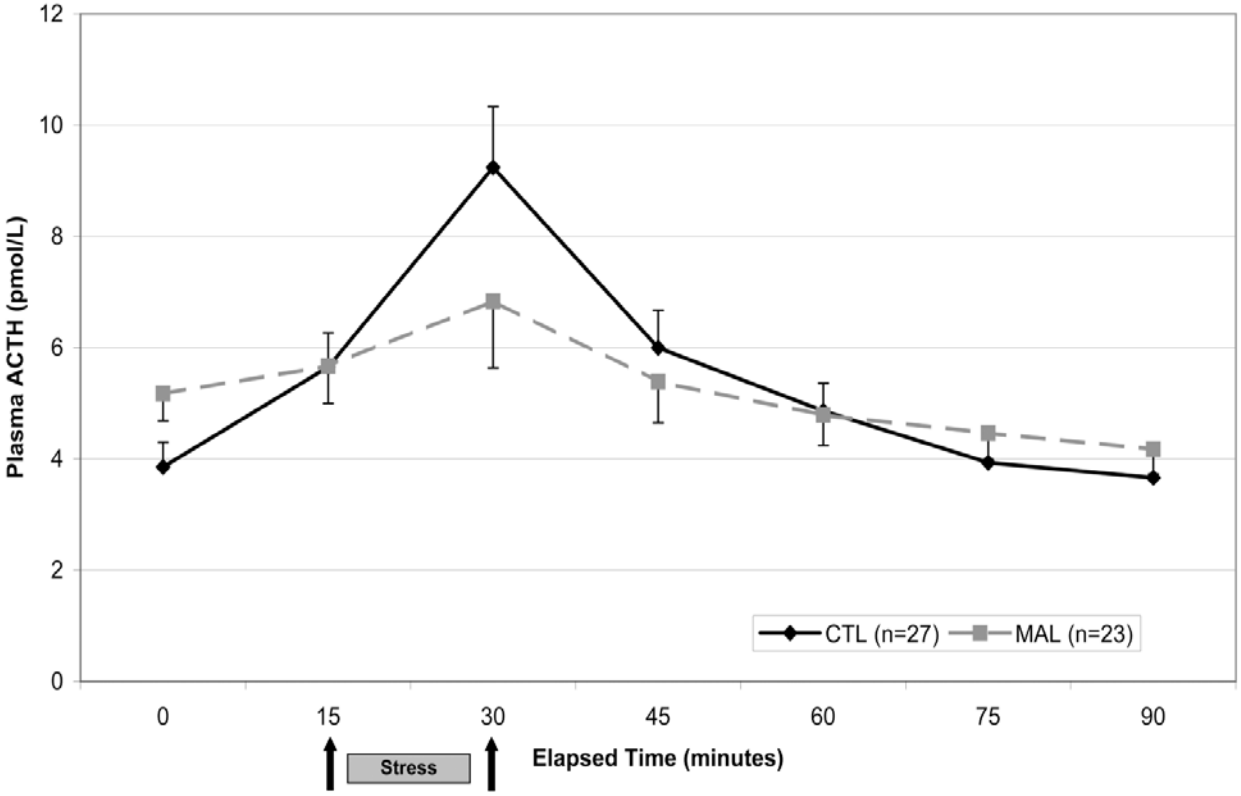


Figure 2: Plasma ACTH response to Trier Social Stress Test. Repeated measures analysis showed a Significant within-subject interaction of Abuse × Time (F=4.3[1.6], p=.02). Analysis of Individual time points revealed none with significant group difference

3.1 Methods

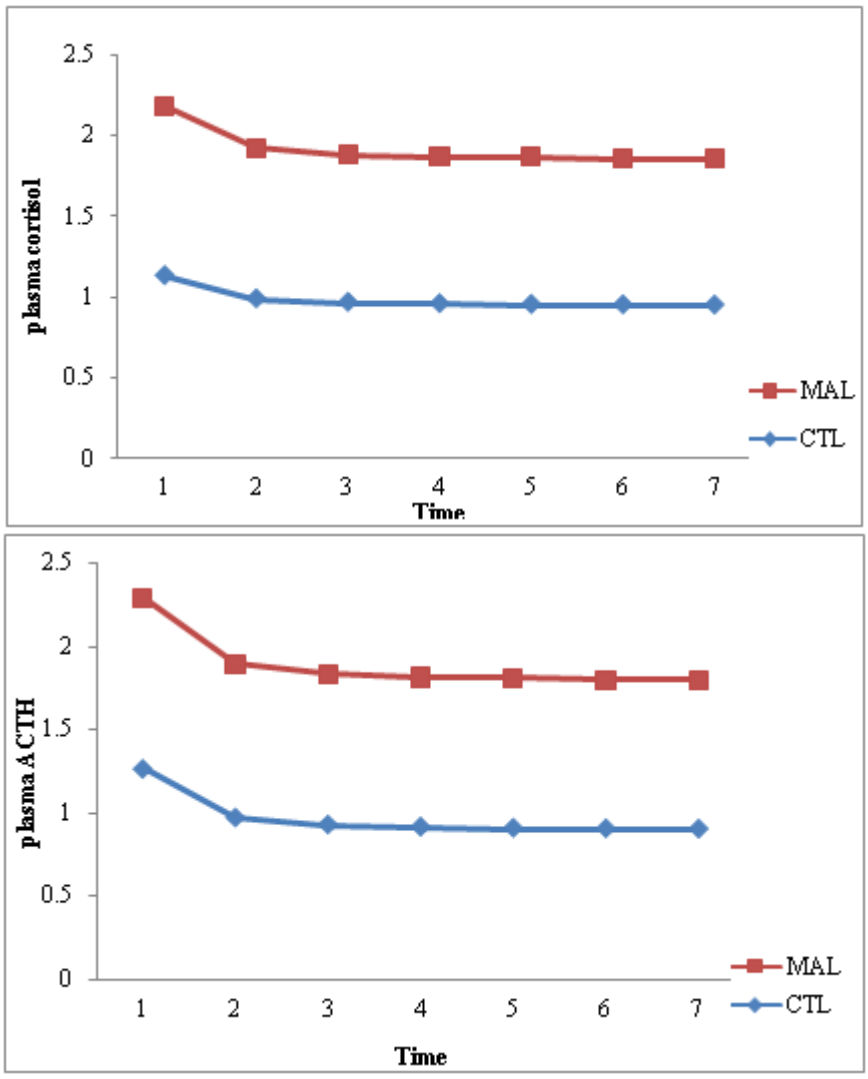
Plasma adrenocorticotropin (ACTH) and Cortisol reactivity to the Trier Social Stress Test were examined in healthy adults (N=50) without current psychopathology. Subjects with a self reported history of moderate to severe childhood maltreatment (MAL; n=23) as measured by the Childhood Trauma Questionnaire were compared with subjects without such a history (CTL; n=27). Fifty adults, ages 20 to 59, were selected for participation by Advertisements for "healthy adults with a history of early life stress". The persons are included only those who scored "moderate" to "severe" on at least one of the five subscales of the Childhood Trauma Questionnaire (CTQ;) and did not meet current DSM-IV criteria for MDD or PTSD (n=23). the healthy volunteers (n=27) were recruited via advertisements for "healthy research subjects." They were selected only those who generated a categorical score of "none" on all five CTQ subscales and were similarly free of current MDD and PTSD[9,10]. All subjects were free of pregnancy, significant medical illness and recreational drug use as evidenced by complete physical and neurological examination, standard laboratory tests, and electrocardiogram.

4. Mathematical Results

Table: 1

	CTL					MAL				
	λ	μ	μ_2	T	$A_D(T)$	λ	μ	μ_2	T	$A_D(T)$
CORTISOL	0.241	4.421	6.525	0.8	1.1351	0.340	3.139	7.049	0.8	1.0481
				2.5	0.9902				2.5	0.9325
				4.1	0.9684				4.1	0.9154
				5.7	0.9597				5.7	0.9089
				7.4	0.9551				7.4	0.9057
				9	0.9526				9	0.9042
				10.7	0.9510				10.7	0.9033
ACTH	0.350	3.208	2.944	0.9	1.2691	0.357	2.997	6.542	0.9	1.0256
				2.6	0.9718				2.6	0.9230
				4.4	0.9288				4.4	0.9052
				6	0.9153				6	0.8994
				7.8	0.9084				7.8	0.8964
				9.5	0.9052				9.5	0.8951
				11.3	0.9035				11.3	0.8944

Availability of Cortisol, ACTH levels of CTL, MAL groups.



5. Conclusion

Medical findings confirmed that Childhood maltreatment is a risk factor for depression, has been examined in nonclinical samples. A group (both men and women samples) reporting a history of moderate to severe childhood maltreatment in the form of neglect or abuse was compared with a group reporting none. In particular, Women with a history of sexual or physical abuse demonstrated increased ACTH but normal Cortisol responses when compared with female control subjects without abuse histories. We found the availability of outages that are deterministically distributed. In application part, When it is applied to Cortisol and ACTH levels of CTL, MAL groups, it showed an excited result that the increased hormonal levels of MAL groups.

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