

# Distress as a Risk Factor for Type 2 Diabetes: An Integrative Review

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## Purpose

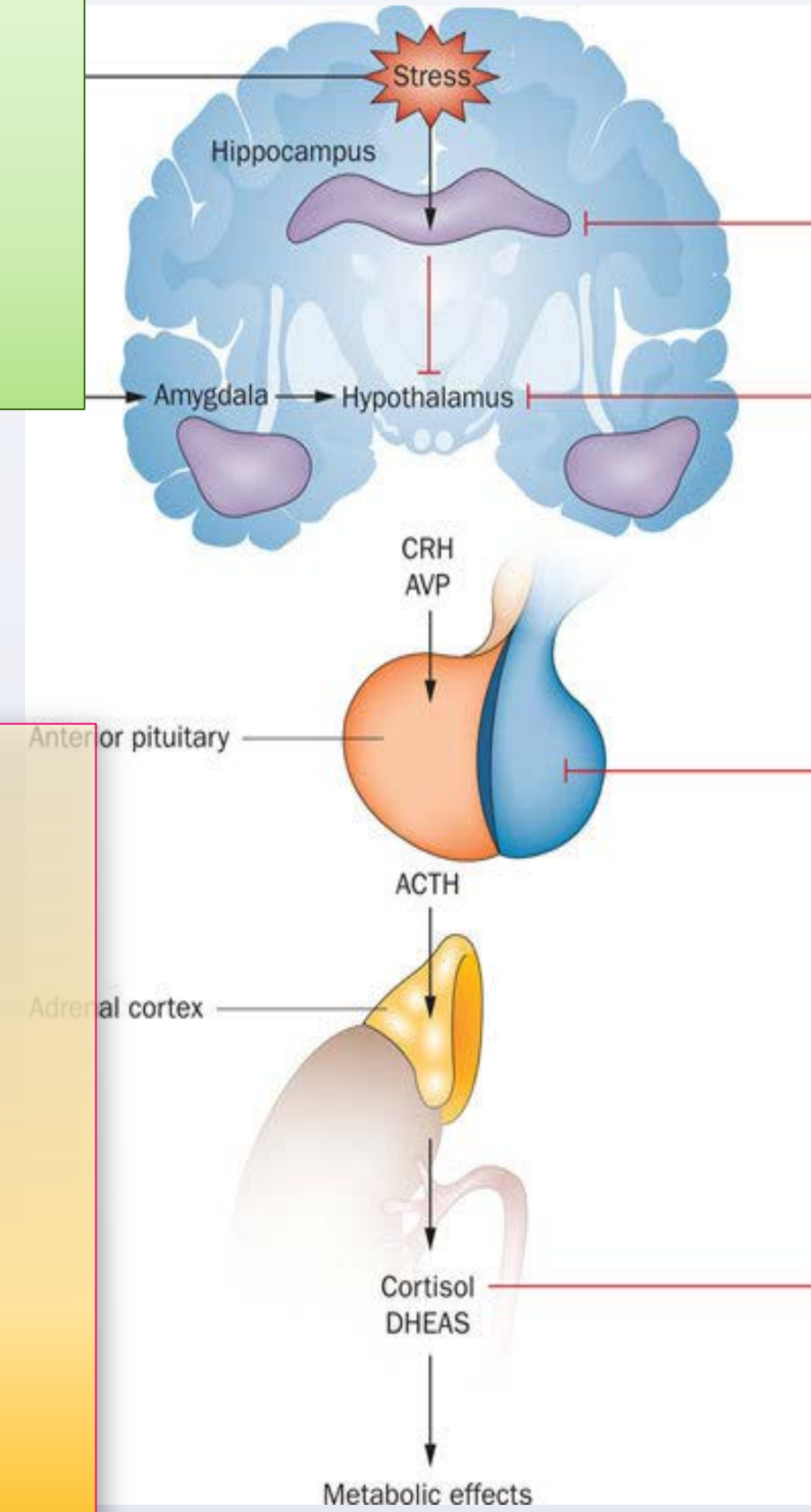
Identify the state of the science for the relationship between distress and insulin resistance (IR), a precursor to the development of type 2 diabetes mellitus (T2DM)

## Research Questions

What is the methodological rigor of studies focused on distress and IR?

What is the relationship between distress, as defined by distressing factors such as depression and work stress, and IR?

How can distress be effectively defined to expand the results on the topic?



## Background

- T2DM is a complex disease of multifactorial origin.
- The relative influence of risk factors remains inconclusive.
- The influence of stress on the development of T2DM is individualized and poorly understood (12).
- Stress increases hypothalamic-pituitary-adrenal (HPA) axis activity and corticosteroid activity (9).
- Cortisol promotes IR and increases blood glucose levels (1, 6).

## Methods

- Databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Google Scholar, Ovid, and PsycInfo
- Exclusion terms for Google Scholar: Oxidative, endoplasmic, secretory, infancy, mice, rats, and adolescents
- Keywords: Distress, depression, stress, psychosocial stress, insulin, prediabetes, diabetes prevention, and IR
- Over 1,600 articles were screened.
- The first 200 articles resulting from a search were screened.
- Only full text articles were reviewed.

Table 1

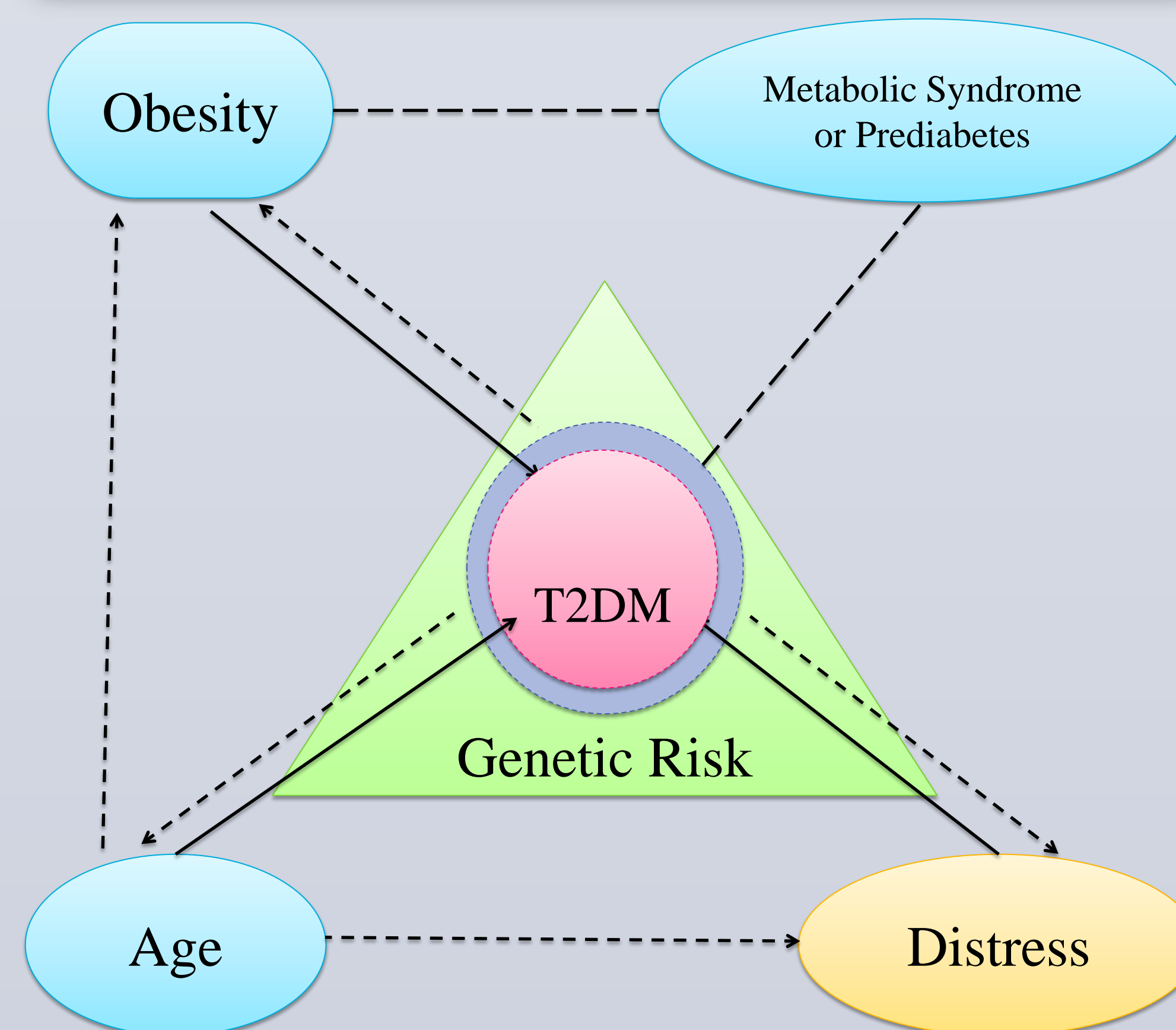
Database Search: Keywords – Distress and Pre-Diabetes				
Databases	CINAHL	Google Scholar	Ovid	PsycInfo
Results	1	1,360	1	1
Full-Text Articles Reviewed	1	4	1	1
Full-Text Articles Kept	0	1	1	0

Table 2

Database Search: Keywords – Stress and Insulin				
Databases	CINAHL	Google Scholar	Ovid	PsycInfo
Results	1,006	31,500	727	514
Full-Text Articles Reviewed	6	11	5	4
Full-Text Articles Kept	0	1 (duplicate)	1	0

Table 3

Database Search: Keywords – Depression and Insulin				
Databases	CINAHL	Google Scholar	Ovid	PsycInfo
Results	231	70,000	86	286
Full-Text Articles Reviewed	2	15	6	0
Full-Text Articles Kept	0	1 (duplicate)	1	0



“An individual’s response to a stressor would depend on multiple factors such as previous experiences with similar stressors and the ability to adapt to such experiences”

– Sister Callista Roy

## Results

### Depression (3, 8)

- Increased the risk for T2DM by at least 66% in women ( $OR=1.66$ , 95% CI [1.05-2.61],  $p<0.03$ )
- Risk for T2DM greater than 2-fold for African-Americans ( $OR=2.56$ , 95% CI [1.27-5.15],  $p=0.008$ )
- The odds of developing T2DM when controlling for age, gender, level of physical activity, and BMI was greater than 2-fold ( $OR=2.5$ , 95% CI [1.29-4.87]).

### Insomnia (10)

- Men with insomnia had higher fasting glucose levels than women ( $p<0.05$ ).
- Women who took greater than 30 minutes to fall asleep showed significantly higher fasting insulin levels and greater insulin resistance than those who fell asleep within 30 minutes ( $b=0.26$ ,  $t=5.49$ ,  $p<0.0001$  and  $b=0.01$ ,  $t=3.24$ ,  $p<0.01$ , respectively).
- Insomnia resulted in greater severity in Beck Depression Inventory scores ( $p<0.001$ ).

### Insomnia & Depression (2)

- A large proportion of women had greater distress than men ( $n=823$ , 25% and  $n=202$ , 8%, respectively).
- Men with high distress scores were more likely to develop T2DM while women with moderate to high distress scores were more likely to develop pre-diabetes ( $OR=2.2$ , 95% CI [1.2-4.1] and  $OR=1.8$ , 95% CI [1.1-3.0], respectively).

### Readiness for Change (4, 8)

- Despite lifestyle improvements, 58% of subjects ( $n=176$ ) remained pre-diabetic or developed T2DM after six months.
- Subjects from low socioeconomic status believed they had less ability to deal with barriers that challenge lifestyle change ( $p=0.08$ ).

### Smoking (12)

- Ex-smokers and current smokers have greater insulin resistance than non-smokers ( $p<0.001$ )
- Smoking greater than 10 cigarettes per day increased the risk for pre-diabetes by more than twofold ( $OR=2.63$ , 95% CI [2.04-3.39],  $p<0.001$ ).

### Work stress (1, 5)

- Men and women in entry level, lower grades of employment were more likely to develop the metabolic syndrome ( $p<0.05$  and  $p<0.01$ , respectively).
- Associated with a 60% higher risk of developing T2DM for women ( $p=0.019$ )
- Increased further if working in isolated conditions with limited social support ( $OR=1.94$ , 95% CI [1.17-3.21],  $p=0.083$ ).

## Conclusion & Implications

- The IR produced by distressing factors may be a risk factor for the development of T2DM.
- A common term used to describe any number of distressing factors would benefit researchers investigating the relationship between distress and IR or the development of T2DM.

## References

- Chandola, T., Brunner, E., & Marmot, M. (2006). Chronic stress at work and the metabolic syndrome: Prospective study. *British Medical Journal*, 332. doi:10.1136/bmj.38693.435301.80
- Eriksson, A. -K., Ekblom, A., Granath, F., Hilding, A., Efendic, S., & Ostenson, C. -G. (2008). Psychological distress and risk of pre-diabetes and type 2 diabetes in a prospective study of Swedish middle-aged men and women. *Diabetic Medicine*, 25, 834-842. doi:10.1111/j.1464-5491.2008.02463.x
- Everson-Rose, S. A., Torrens, J. I., Meyer, P. M., Kravitz, H. M., Powell, L. H., Bromberger, J. T... Matthews, K. A. (2004). Depressive symptoms, insulin resistance, and risk of diabetes in women at midlife. *Diabetes Care*, 27(12), 2856-2862. Retrieved from <http://care.diabetesjournals.org/content/28/5/1265.extract>
- Hankonen, N., Absetz, P., Haukkala, A., & Uutela, A. (2009). Socioeconomic status and psychosocial mechanisms of lifestyle change in a type 2 diabetes prevention trial. *Annals of Behavioral Medicine*, 38, 160-165. doi:10.1007/s12160-009-9144-1
- Heraclides, A., Witte, D. R., Chandola, T., & Brunner, E. J. (2009). Psychosocial stress at work doubles the risk of type 2 diabetes in middle-aged women: Evidence from the Whitehall II Study. *Diabetes Care*, 32(12), 2230-2235. doi:10.2337/dc09-0132
- McEwen, B. (2003). Mood disorders and allostatic load. *Society of Biological Psychiatry*, 54, 200-207. doi:10.1016/S0006-3223(03)00177-X
- Moore, S. M., Hardie, E. A., Hackworth, N. J., Critchley, C. R., Kyrios, M., Buzwell, S. A., & Crafti, N. A. (2011). Can the onset of type 2 diabetes be delayed by a group-based lifestyle intervention? A randomised control trial. *Psychology and Health*, 26(4), 485-499. doi:10.1080/08870440903548749
- Palinkas, L. A., Lee, P. P., & Barrett-Connor, E. (2004). A prospective study of type 2 diabetes and depressive symptoms in the elderly: The Rancho Bernardo Study. *Diabetes Medicine*, 21, 1185-1191. doi:10.1111/j.1464-5491.2004.01315.x
- Selye, H. (1976). *The stress of life* (2<sup>nd</sup> ed.). New York, NY: McGraw-Hill.
- Suarez, E. C. (2008). Self-reported symptoms of sleep disturbance and inflammation, coagulation, insulin resistance, and psychological distress: Evidence for gender disparity. *Brain, Behavior, and Immunity*, 22(6), 960-968. doi:10.1016/j.bbi.2008.01.011
- Vlassopoulos, A., Lean, M. E., & Combet, E. (2013). Influence of smoking and diet on glycated haemoglobin and pre-diabetes categorization: A cross-sectional analysis. *BMC Public Health*, 13. doi:10.1186/1471-2458-13-1013
- Wales, J. (1995). Does psychological stress cause diabetes? *Diabetic Medicine*, 12, 109-112. doi:10.1111/j.1464-5491.1995.tb00439.x

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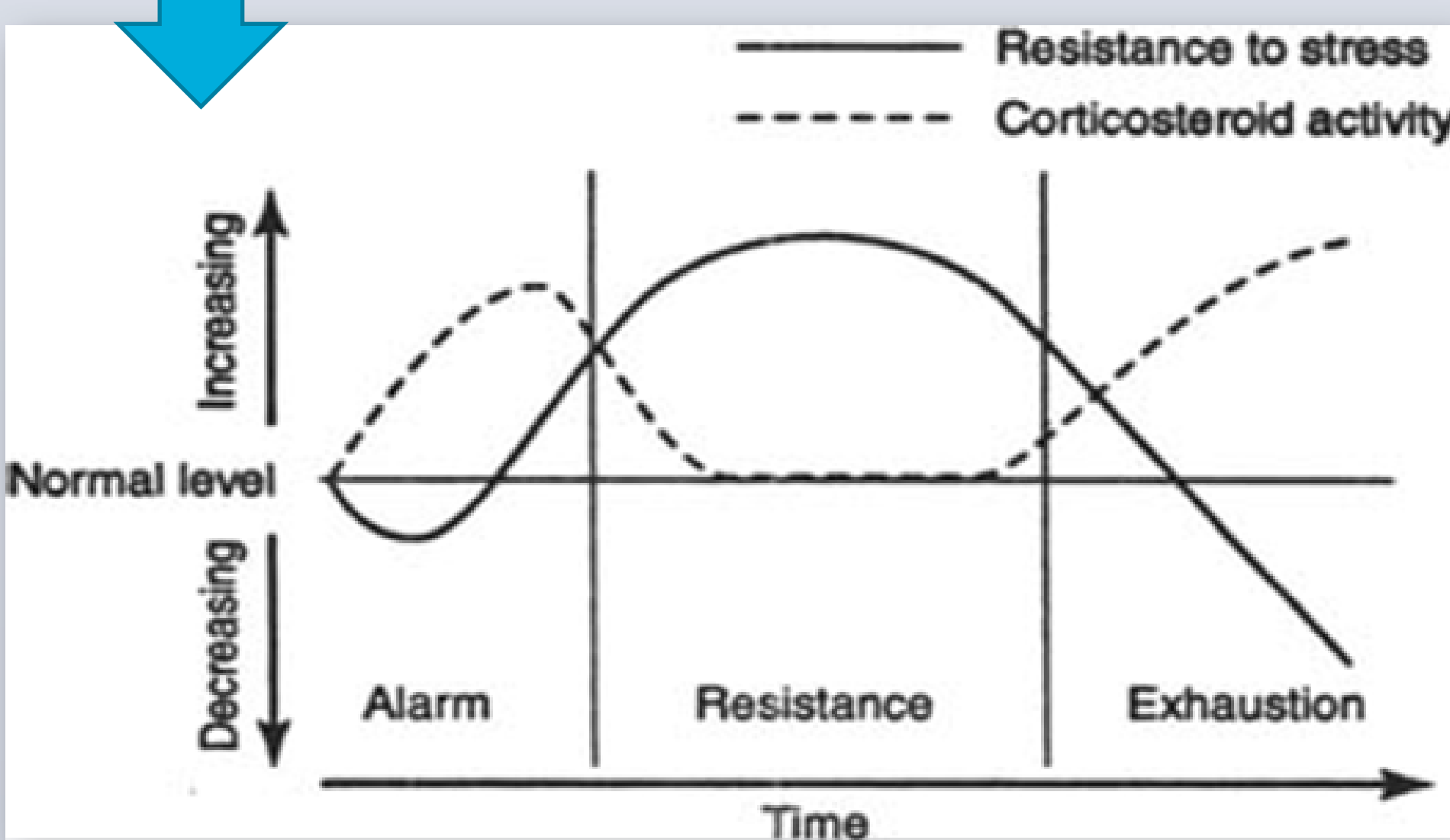


Figure 1. Compilation of the stress response and corticosteroid activity. During the Alarm Phase and Exhaustion Phase, the corticosteroid activity increases as the resistance to stress decreases (Selye, 1976, p. 111 & p. 163). Printed with permission for educational purposes.