

Neuroendocrine Contributions to Pubertal Development

Elizabeth Shirtcliff

Harlow Center for Biological Psychology
University of Wisconsin - Madison

Overview

- ▶ Why Study Endocrinology?
- ▶ Paradox of Hormones and Behavior
- ▶ Organizational-Activational Hypothesis
- ▶ Adjustment Models
- ▶ Biosocial Models
- ▶ Biological Mediation Models

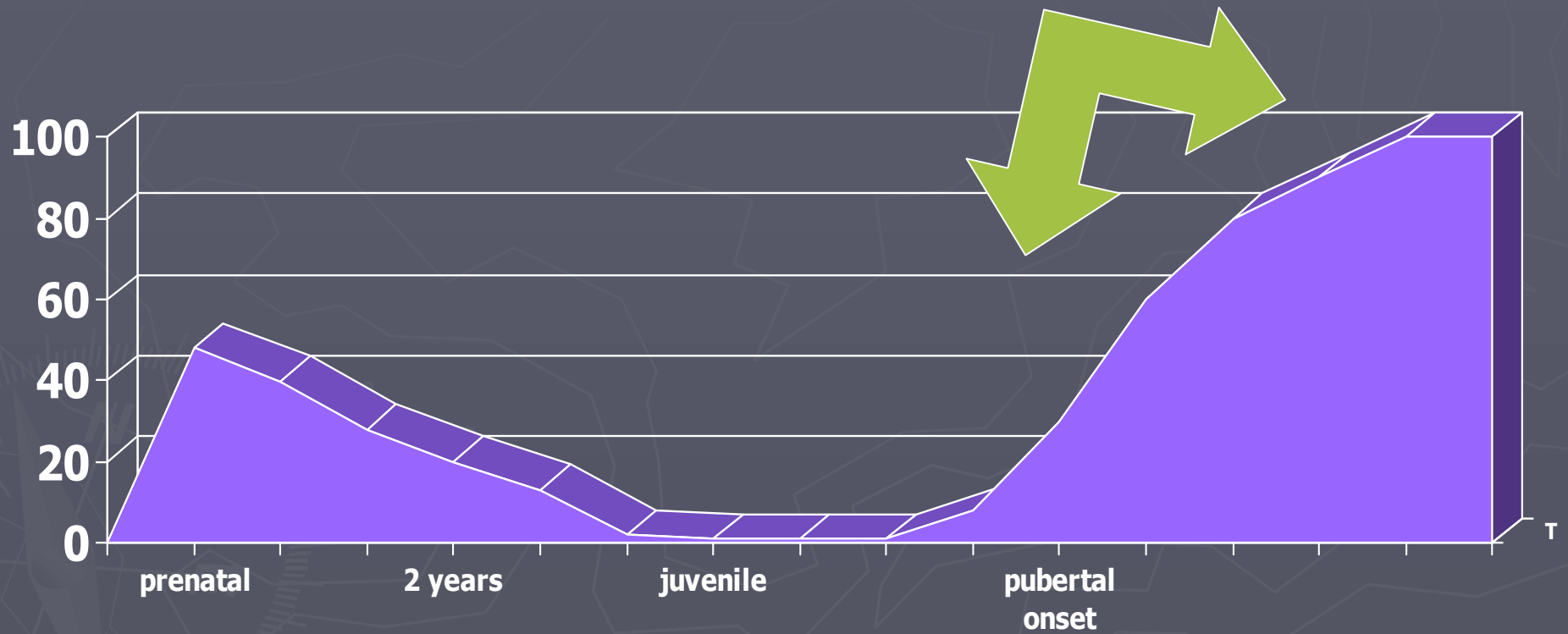
Why Study Endocrinology?

- ▶ Points to a Mechanism: A window into the Etiology of a disorder
- ▶ May indicate who is most vulnerable
- ▶ May change after intervention

Why Not Study Endocrinology:

- ▶ The fall of “Raging Hormones”
- ▶ Simple hormone-behavior relationship?
 - § Curvilinear Relationships
 - § Developmental Windows
 - § Cyclic Activity
 - § Biosocial Interactions
- ▶ The paradox of hormones and behavior:

Paradox of Hormones and Behavior



Pursuing other models...

Paradox of Hormones and Behavior

- ▶ Hormones rise at puberty
- ▶ Behavior problems rise at puberty
- ▶ Behavior problems rise higher in individuals with early puberty
- ▶ Hormones Activate Affective Neurocircuitry
- ▶ BUT, hormones are rarely directly correlated with behavior
- ▶ Rising behavior problems are *after* pubertal onset

A Developmental Model:

The Organizational Activational Hypothesis

Organizational-Activational Hypothesis

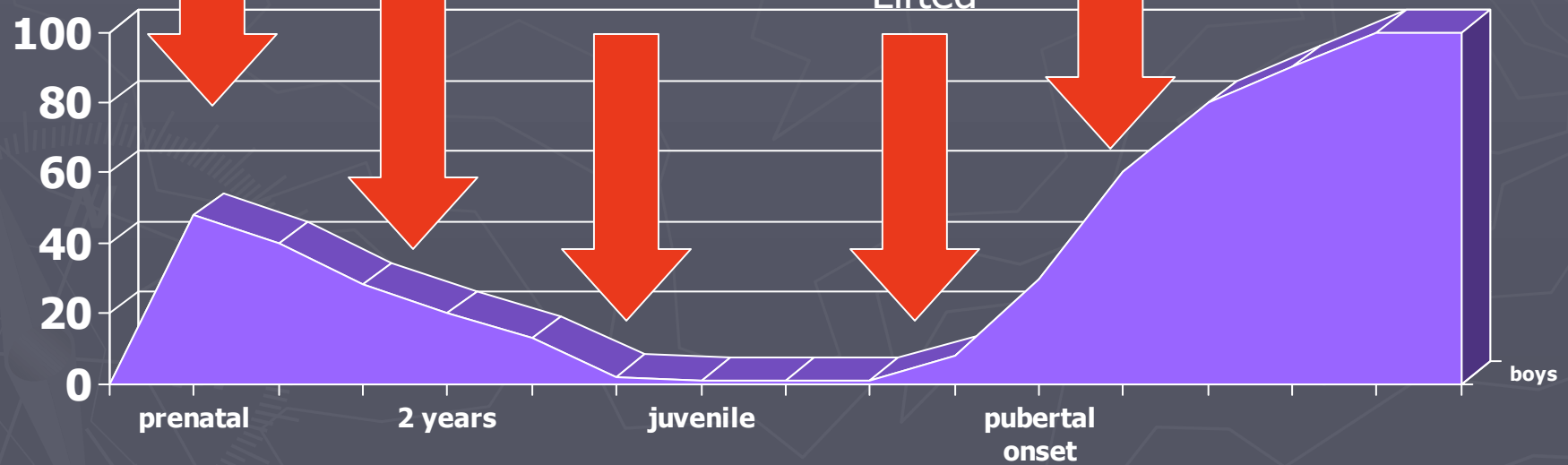
Prenatal Testes
Release Hormones

GnRH Pulse
Generator
Active

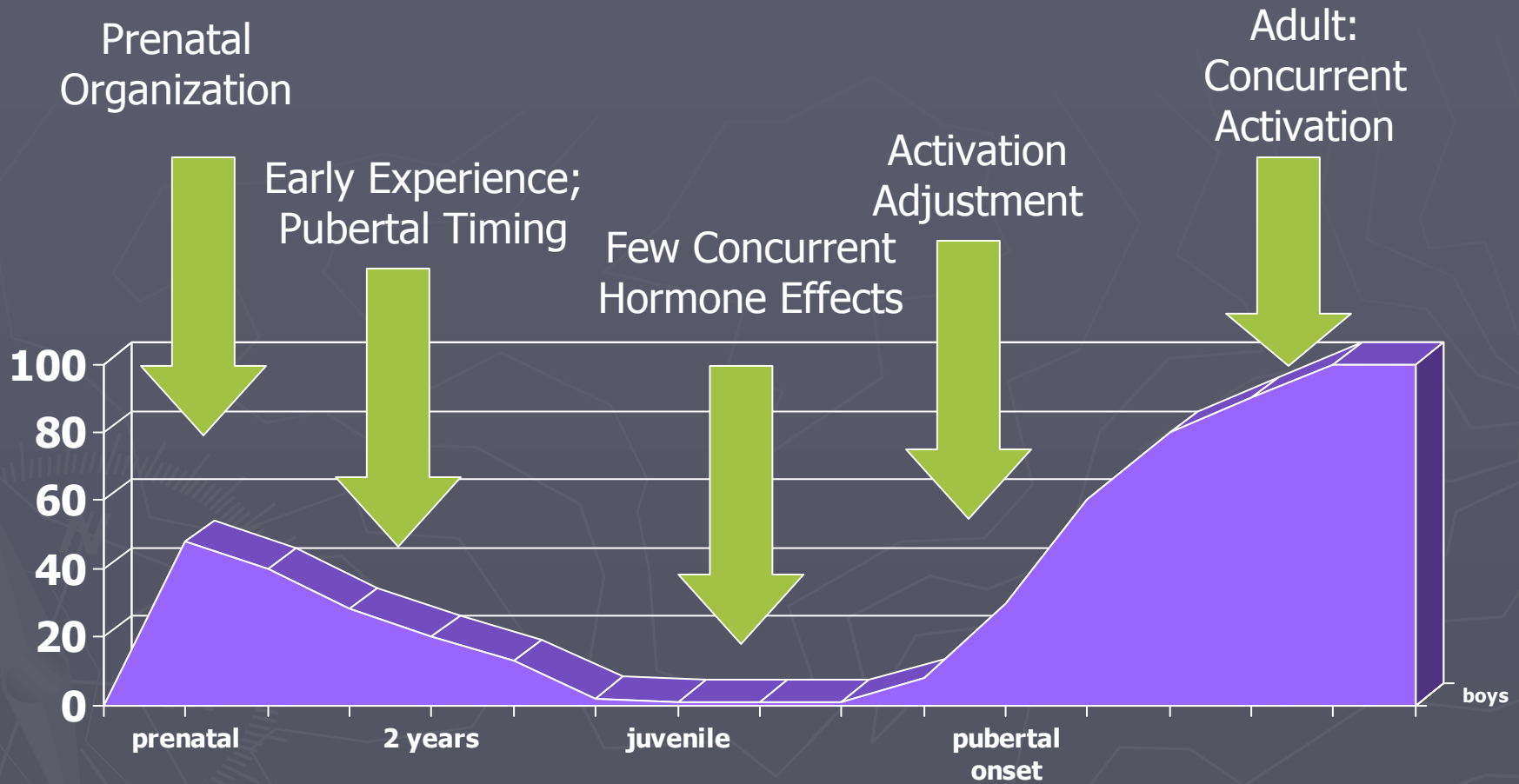
GnRH
Inhibited

GnRH brake
Lifted

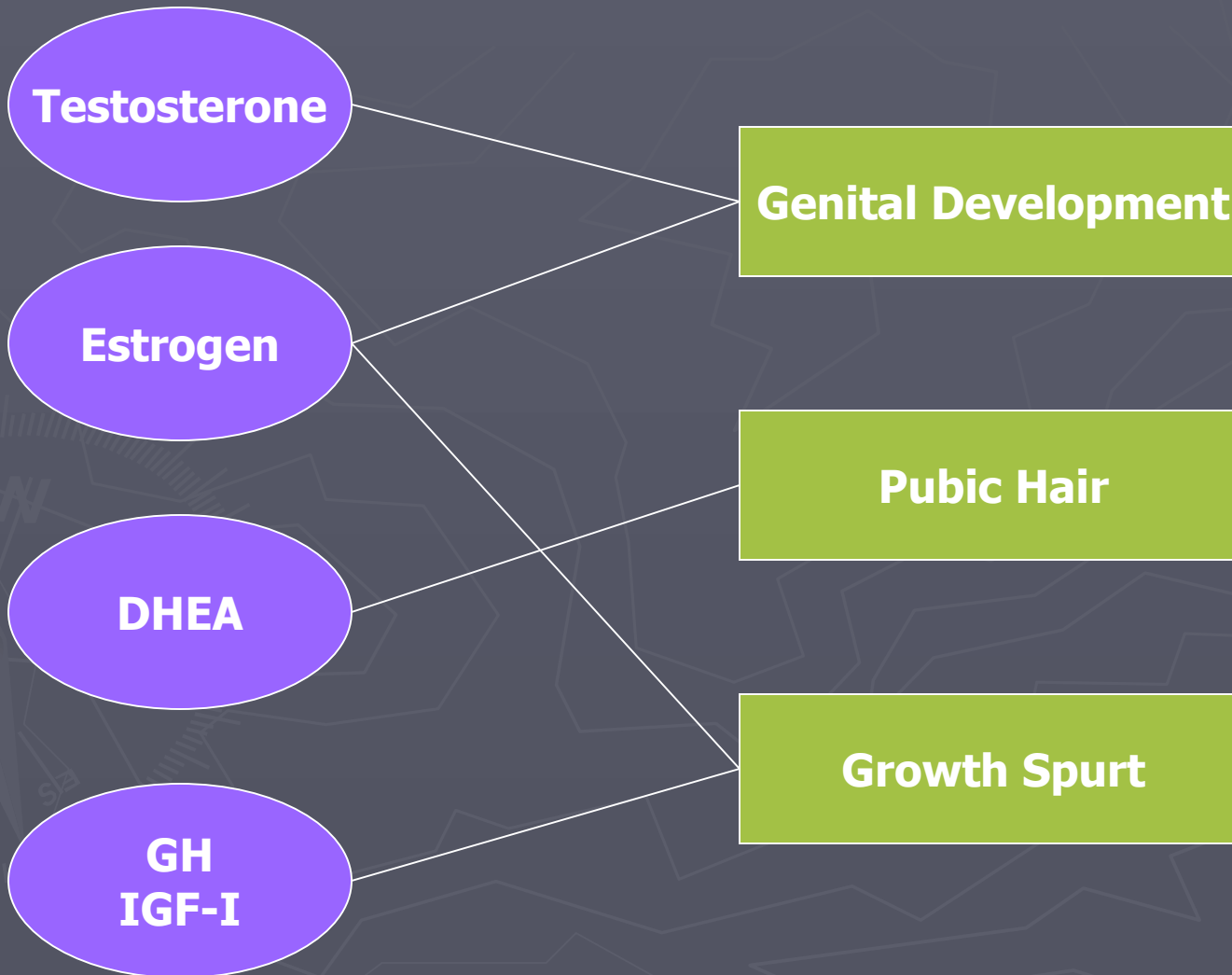
Secondary Sex
Characteristics



Organizational-Activational Hypothesis



Activational Effects of Hormones



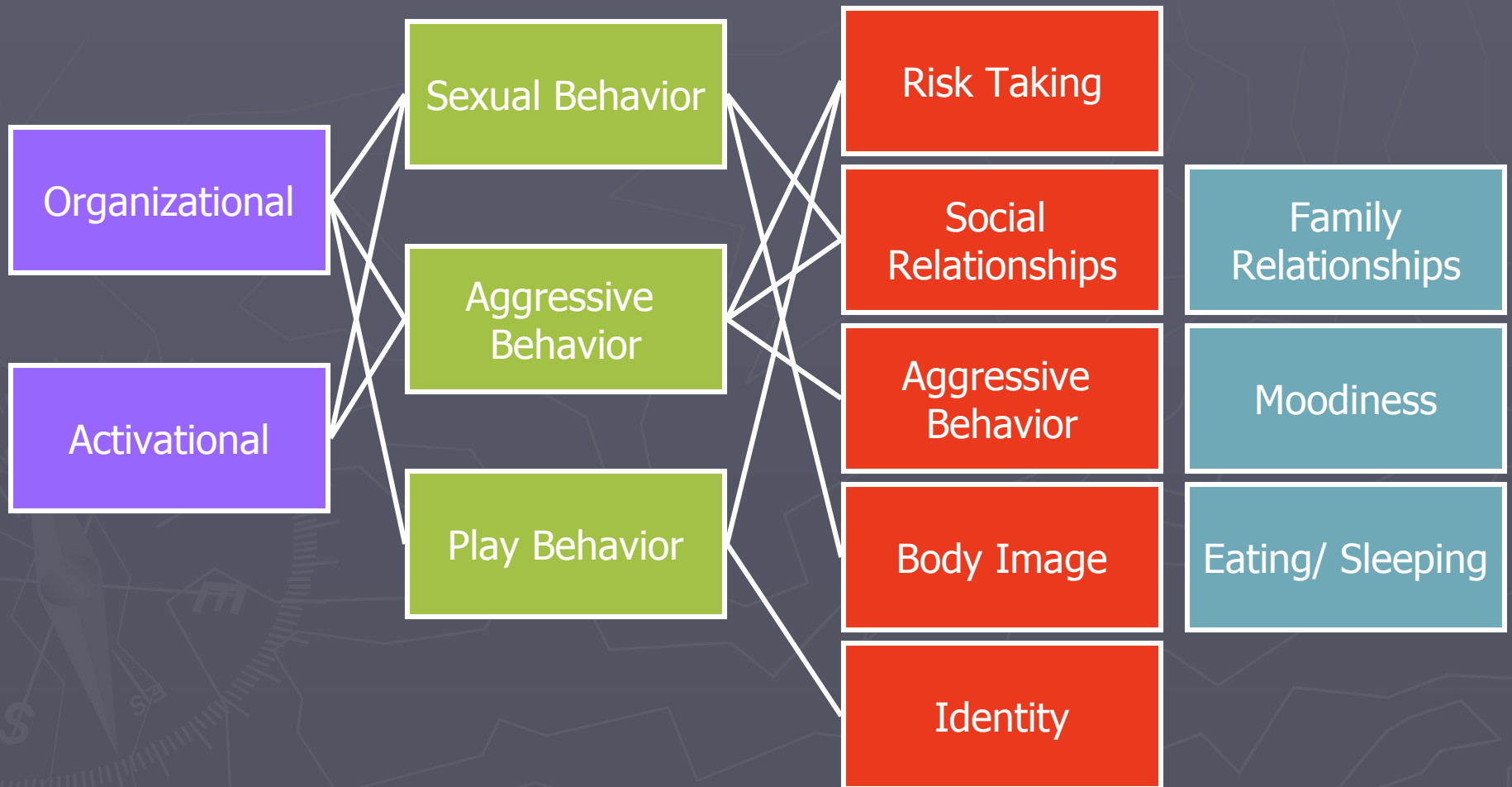
Organizational-Activational Hypothesis

- ▶ The same hormones that Organize sex characteristics later Activate Them
- ▶ The Juvenile period actively Inhibits further sexual development
- ▶ Sex steroids have little effect on Juveniles
- ▶ Puberty Marks the Activation of Earlier Structures
- ▶ Affect-related brain areas are rich in hormone receptors *after pubertal onset*
- ▶ Initial re-activation may be challenging
 - § Hormones are Biphasic
 - § Feedback Loops must be established

Implications

- ▶ Hormones big part of early experience
 - § Effects of early experience may be long lasting
 - § Social/ physical environment clearly important
 - § Effect may be to change pubertal timing
- ▶ Juvenile period 'hormone-free' earlier hormone exposure shows residual effect.
- ▶ Adolescents adjust to hormonal activation.
- ▶ An extension of the hypothesis...

Extension of Hypothesis



Adjustment Model:

An Activational Framework

Adjustment Model

- ▶ Adolescents must adjust to new hormonal state.
- ▶ Hormones enhance mood, wellbeing
- ▶ Hormones behave differently in adolescence
 - § Low and high hormones related to mood
 - § Hormone variability predicts mood variability
 - § Adolescents sensitive to small hormone changes
- ▶ Infrequently tested

Biosocial Model:

A Contextual Framework

Biosocial Models

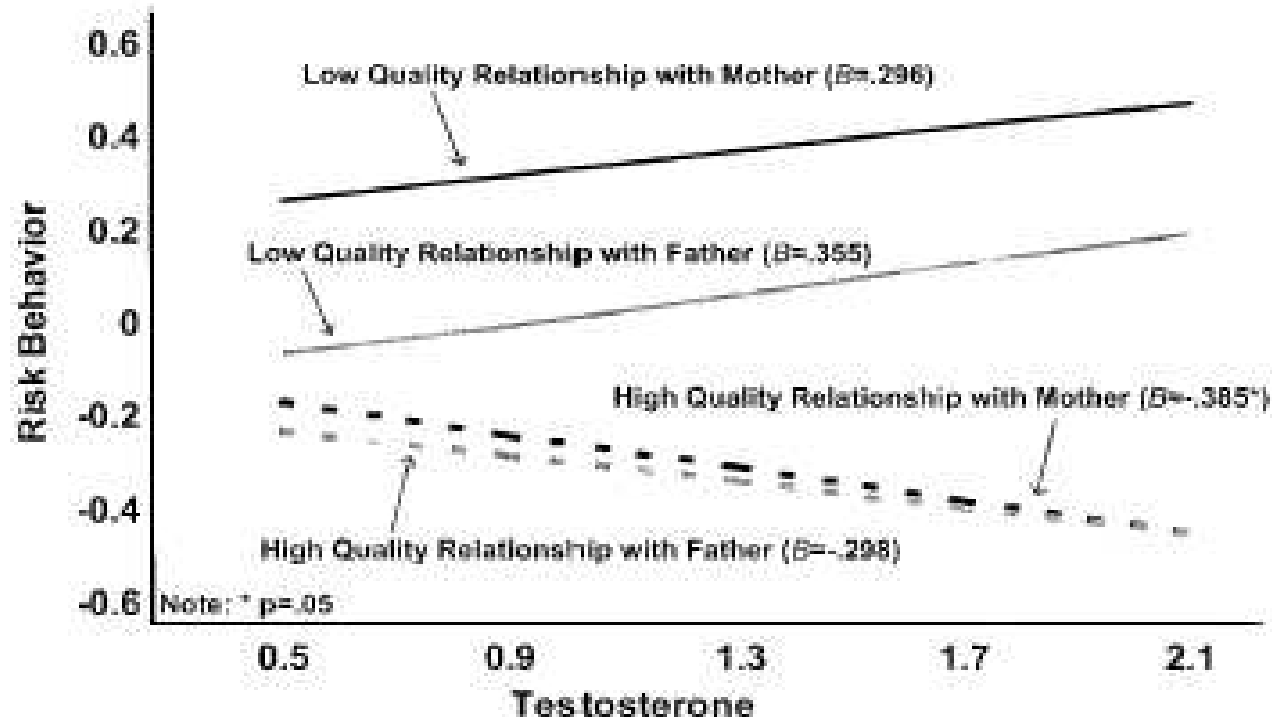


Figure 2. Risk behavior as a function of the interaction between son's testosterone and mother- and father-son relationship quality with son's age, son's age squared, and parents' testosterone controlled. Risk behavior and testosterone were \log_{10} transformed.

Biosocial Models

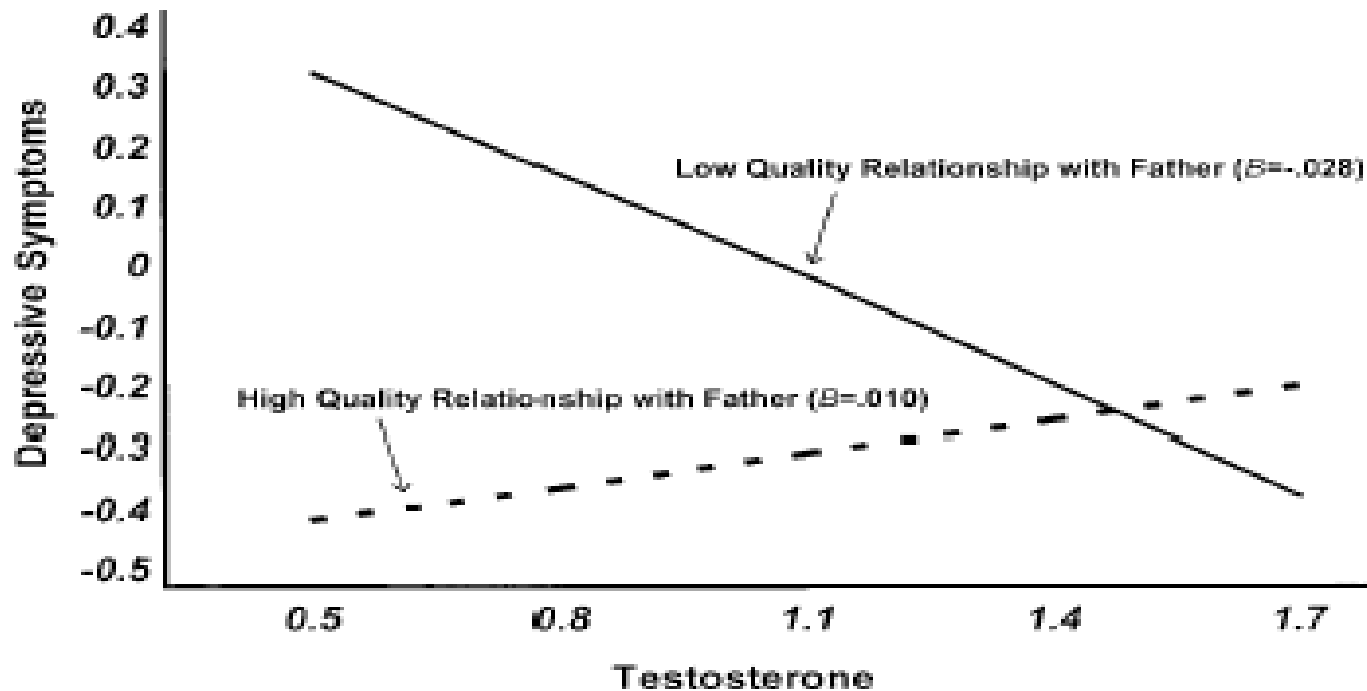


Figure 5. Depressive symptoms as a function of the interaction between daughter's testosterone and father-daughter relationship quality with daughter's age, daughter's age squared, and parents' testosterone controlled. Depressive symptoms were z-scored; testosterone was \log_{10} transformed.

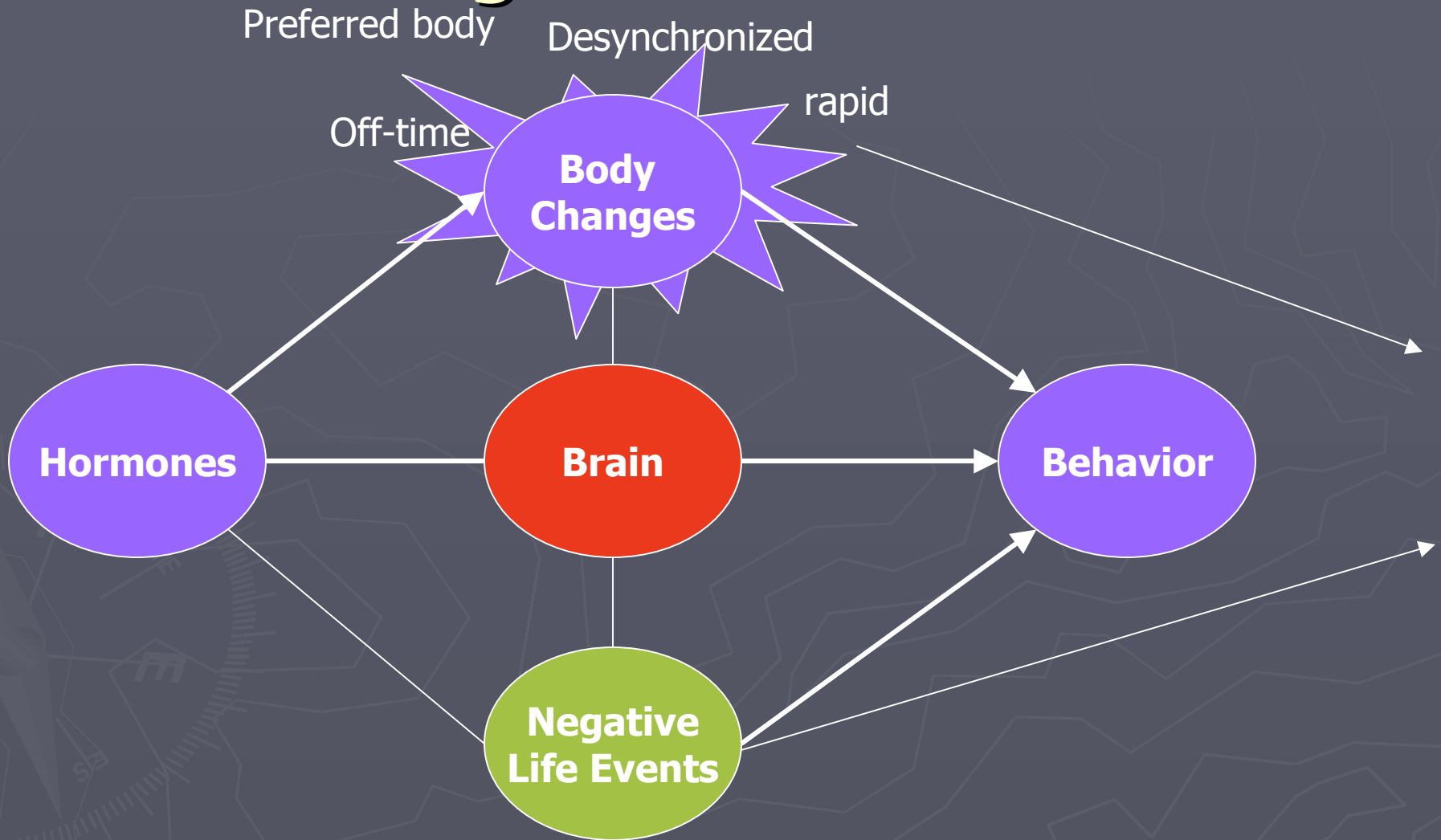
Biosocial Models

- ▶ Hormones facilitate, exaggerate behavior – even positive behaviors
- ▶ The biological basis of social behavior is context-dependent
- ▶ High or Low hormones can place adolescent at risk for behavior problems in the right context

Mediation Model:

A Secondary Effects Framework

Biological Mediation



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Areas in Need of Research

▶ Hormones

- § Adjustment Models
- § Variability Models
- § Synchrony Models

▶ Behaviors

- § Parent Child Conflict
- § Mood Swings (Not Negative Affect)
- § Normative Risk Behavior
- § Drug Use and Addiction

▶ Sex Differences