Temperament, Shyness, and Anxiety Disorders:
Looking for Links in Childhood

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Outline

- Part I: Basic Science
  - The phenomenon of temperamental shyness and issues of stability
  - Individual X context interactions
  - Malleability and change
- Part II: Educational and Policy Implications
  - Not at all shy children are alike
  - Searching for moderating influences

I. Basic science

- Use the phenomenon of temperamental shyness as an example to illustrate three basic questions in personality theory and development

3 Questions

1. Are there early appear behavioral and physiological characteristics that are stable across time and context and predict reactivity and outcome in some children?

2. Are there particular environments (contexts) that interact with these individual characteristics to confer a particular outcome?

3. Are these individual characteristics open to change?

The phenomenon and issues of stability

Question 1:

Are there early appear behavioral and physiological characteristics that are stable across time and context and predict reactivity and outcome in some children?

Measuring brain electrical activity (EEG) in a temperamentally shy child and adult

traditional 32 channel 10/20 EEG cap

128 channel dense EEG net

What do we know about its biological correlates?

Disparate findings on multiple psychophysiological measures at rest (baseline) and in response to stress across development, including:

Our Published Studies from 1994-2010

- Studies of Typically Developing Infants
  - **greater relative right frontal EEG asymmetry**
  - **increased startle responses**

- Studies of Typically Developing Children
  - **greater relative right frontal EEG asymmetry**
  - **high and stable heart rate**
  - **high morning basal and reactive salivary cortisol**

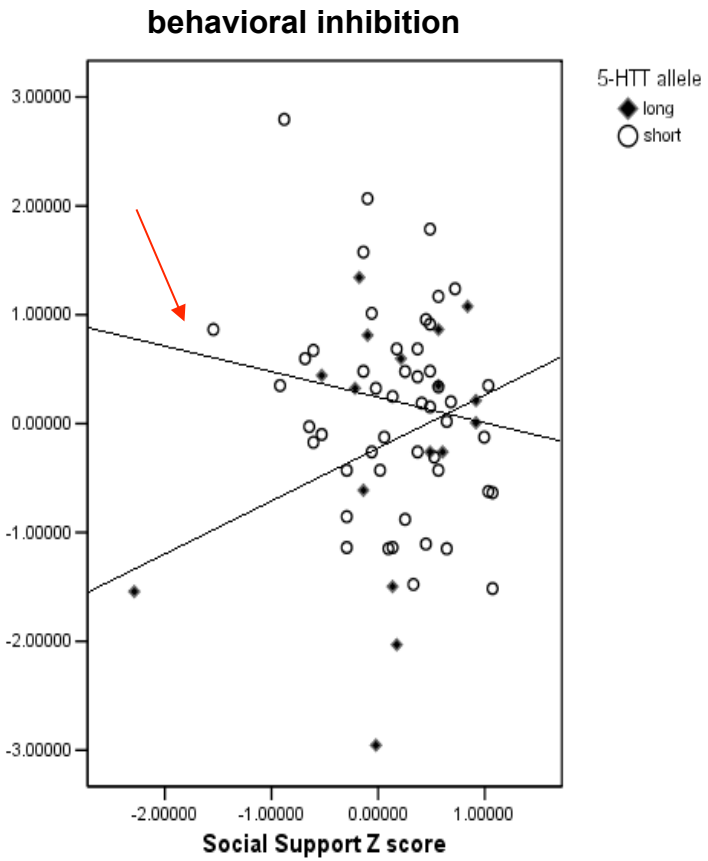
- Studies of Healthy Young Adults
  - **high and stable heart rate and low vagal tone**
  - **low baseline salivary cortisol**
  - **greater relative right frontal EEG asymmetry**
  - **greater bilateral amygdala activation to unfamiliar faces**

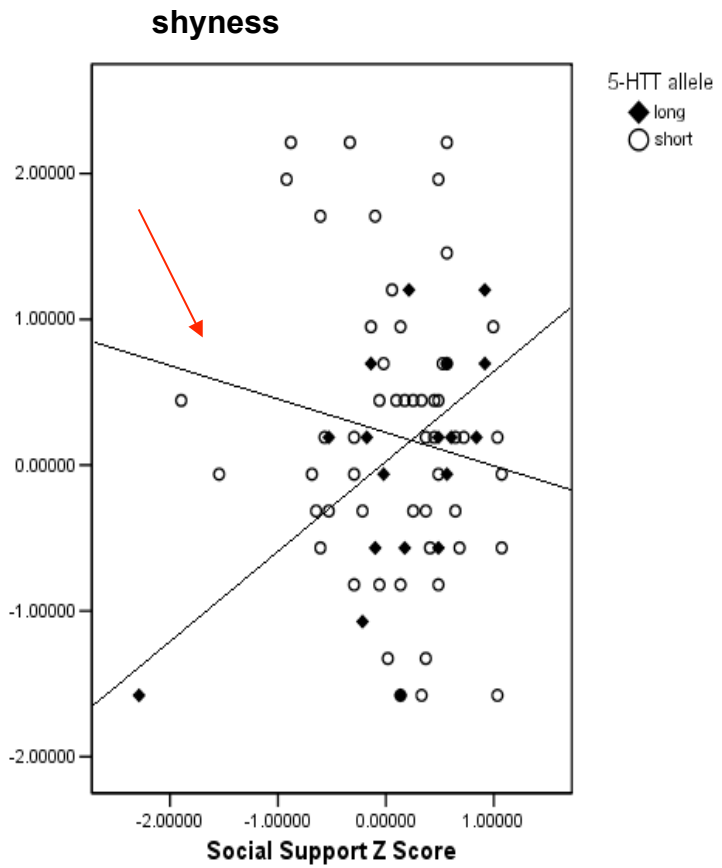
Individual X context interactions

Question 2:

Are there particular environments (contexts) that interact with these individual characteristics to confer problem outcome or protection?

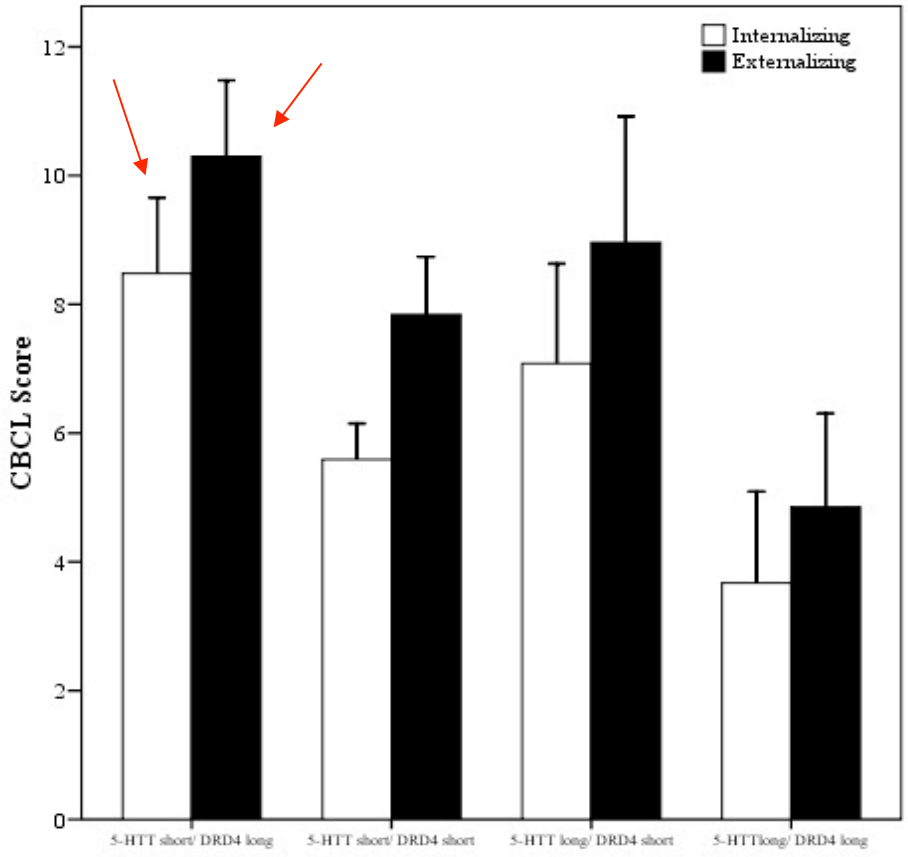
Evidence for a gene-environment interaction in predicting behavioural inhibition and shyness in middle childhood





Fox, N.A., Nicols, K., Henderson, H., Rubin, K.H., Schmidt, L.A., Hamer, D., Ernst, M., & Pine D.S. (2005). *Psychological Science*, *16*, 921-926.

Evidence for a gene-gene interaction in predicting children's behaviour problems in middle childhood

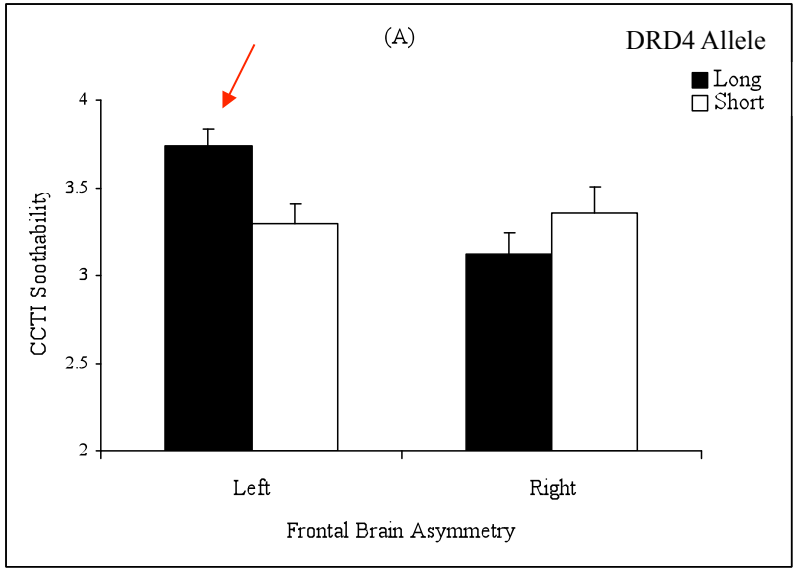


Schmidt, L.A., Fox, N.A., & Hamer, D.H. (2007). *Development and Psychopathology*, *19*, 1105-1116.

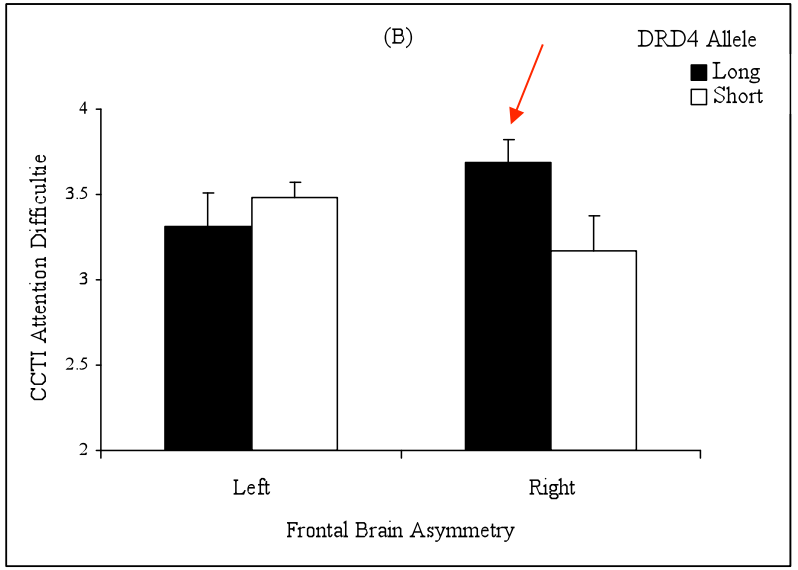
Gene-”endo”evironmental interactions

- Schmidt, L.A., Fox, N.A., Perez-Edgar, K., & Hamer, D.H. (2009). Linking gene, brain, and behavior: DRD4, frontal asymmetry, and temperament. *Psychological Science, 20, 831-837.*
- Risk alleles provide differential sensitivity
- E.g., DRD4 long (risk allele) in the presence of…
  - Exogenous environments (good parenting) “for better”
  - Exogenous environments (bad parenting) “for worse”

Evidence for a gene-endoenvironment interaction in predicting children's behaviour



Long DRD4 allele in the presence of left frontal EEG asymmetry = easily soothable ("for better")



Long DRD4 allele in the presence of right frontal EEG asymmetry = attention problems ("for worse")

Malleability and change

Question 3:

Are these individual characteristics open to change?

Resting brain activity and temperamental shyness

Temperamenally shy adults exhibit patterns of resting frontal EEG activity that are similar to temperamentally shy children: greater relative right frontal EEG activity

Schmidt, L.A. (1999). Frontal brain electrical activity in shyness *and* sociability. *Psychological Science*, *10*, 316-320.

Psychotherapy and the brain

Miskovic, V., Moscovitch, D.A., Santesso, D.L., McCabe, R.E., Antony, M.M., & Schmidt, L.A. (2010). Changes in EEG cross-frequency coupling during cognitive behavioral therapy for social anxiety disorder. *Psychological Science, in press.*

Study overview

Participants

- Individuals (*n* = 25; 12 females, 13 males, M age = 35.9 years) with principal confirmed diagnosis of Social Anxiety Disorder underwent 12 sessions of standardized, therapist-administered group CBT

Assessments

- Pre-treatment 1
- Pre-treatment 2
- Mid-treatment (after session six)
- Post-treatment

Symptom changes

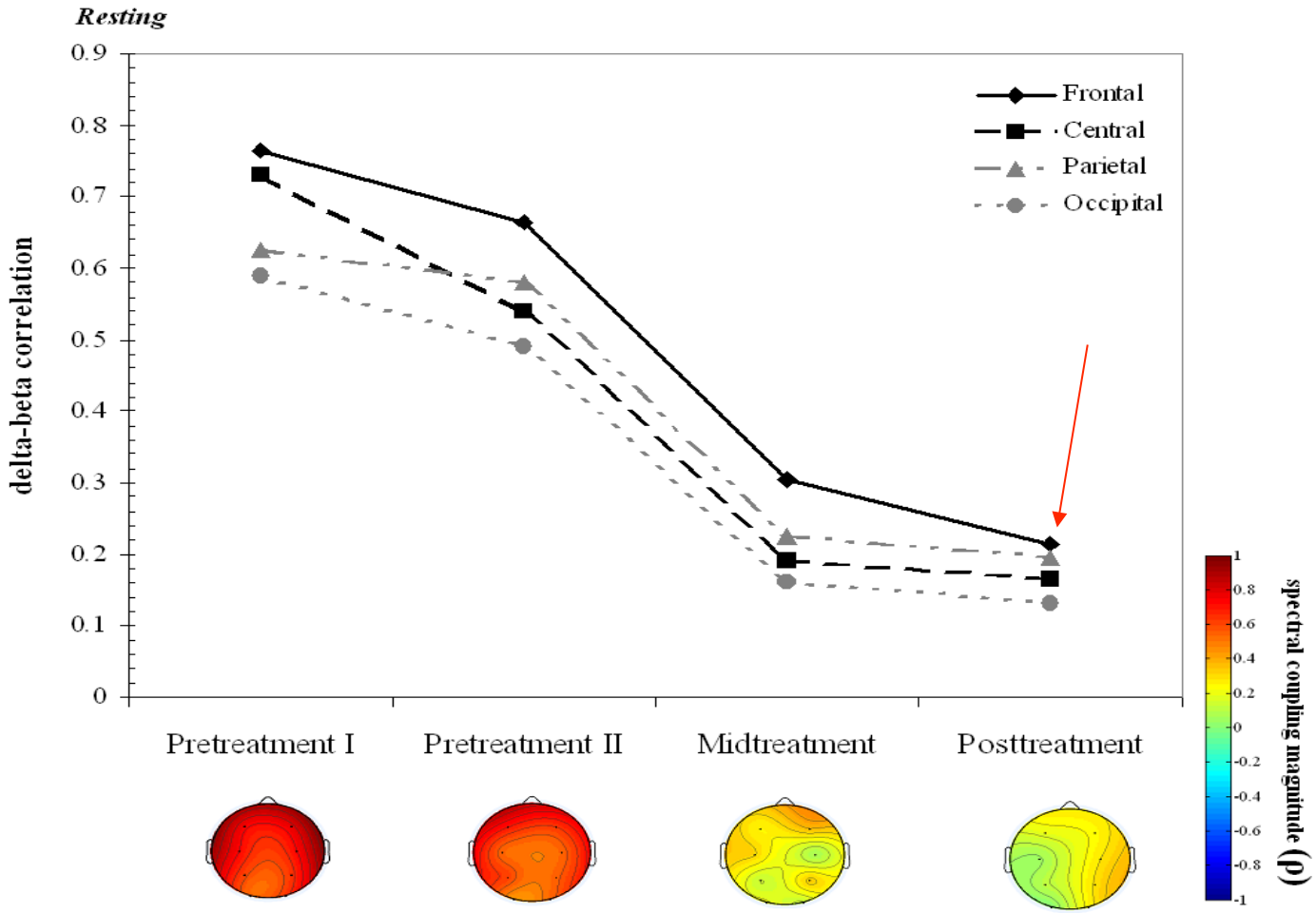
(A) *Clinician Rated*

Scale	*Pretreatment*	*Posttreatment*	*p-value*	*partial η2*
CGI Illness Severity (Independent Clinician)	5.00 (0.17)	4.29 (0.26)	< **0.001**	0.47
CGI Illness Severity (Group Therapist)	5.28 (0.17)	3.76 (0.23)	< **0.001**	0.64

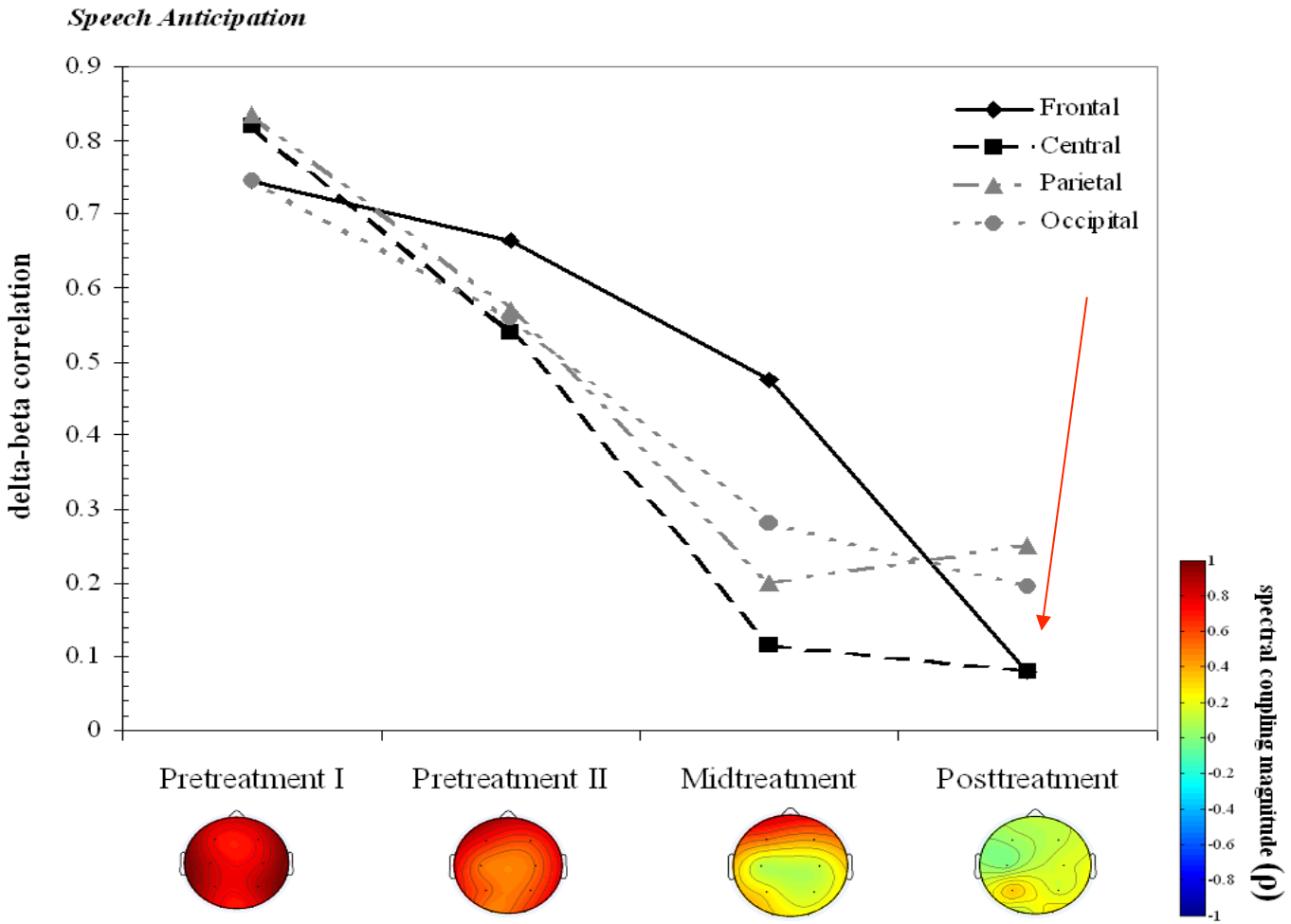
(B) *Patient Rated*

IIRS Total	59.48 (2.70)	51.33 (4.12)	**0.017**	0.25
SPIN Total	46.92 (2.50)	31.83 (3.21)	< **0.001**	0.59
LSAS-SR Total	97.42 (4.65)	67.13 (6.56)	< **0.001**	0.54
BDI-II Total	23.96 (1.89)	17.42 (2.37)	**0.003**	0.33

Changes in delta-beta correlation during CBT for SAD at rest



Changes in delta-beta correlation during CBT for SAD in response to speech anticipation



Summary

- Part I: Basic Science
  - Issues of stability
    - Individual characteristics stable across time and context
  - Individual X context interactions
    - Individual characteristics interact with different environmental conditions within and outside of the individual to confirm risk and protection
  - Malleability and change
    - Individual characteristics are open to change

Outline

- Part II: Educational and Policy Implications
  - Not at all shy children are alike
  - Searching for moderating influences (e.g., biology, parenting, peers relations, school environments) between temperamental shyness and problem behaviour

Not at all shy children are alike

Conceptualizing different types of childhood shyness

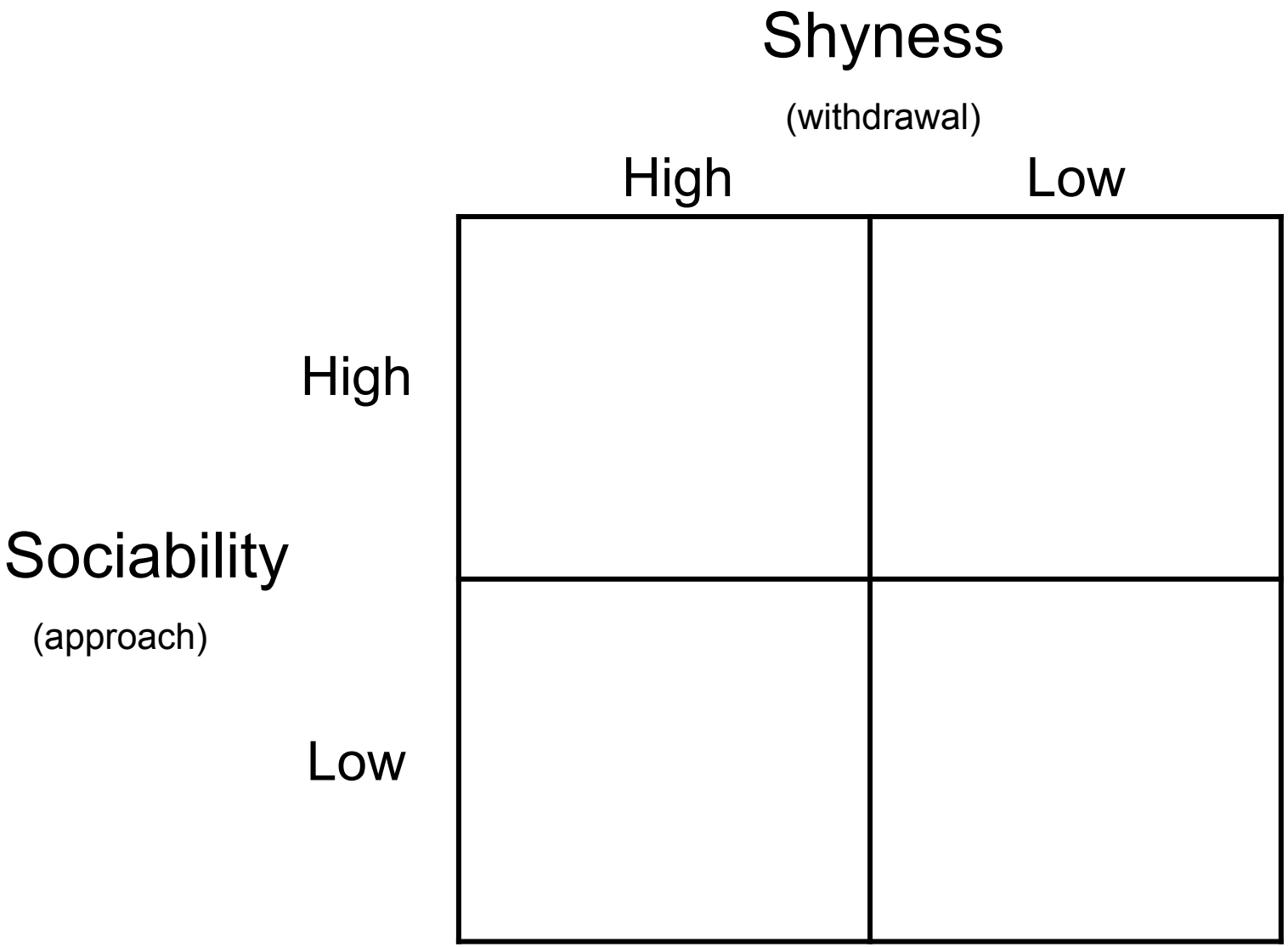
Some people are quiet and reserved in social situations (Cheek & Buss, 1981)…

1) Are they this way because they prefer to be alone rather than with others (i.e., introverts)?

2) Are they this way because they feel anxious in social situations (i.e., shy)?

3) Are shyness and sociability so intimately related to be high on one means to be low on the other?

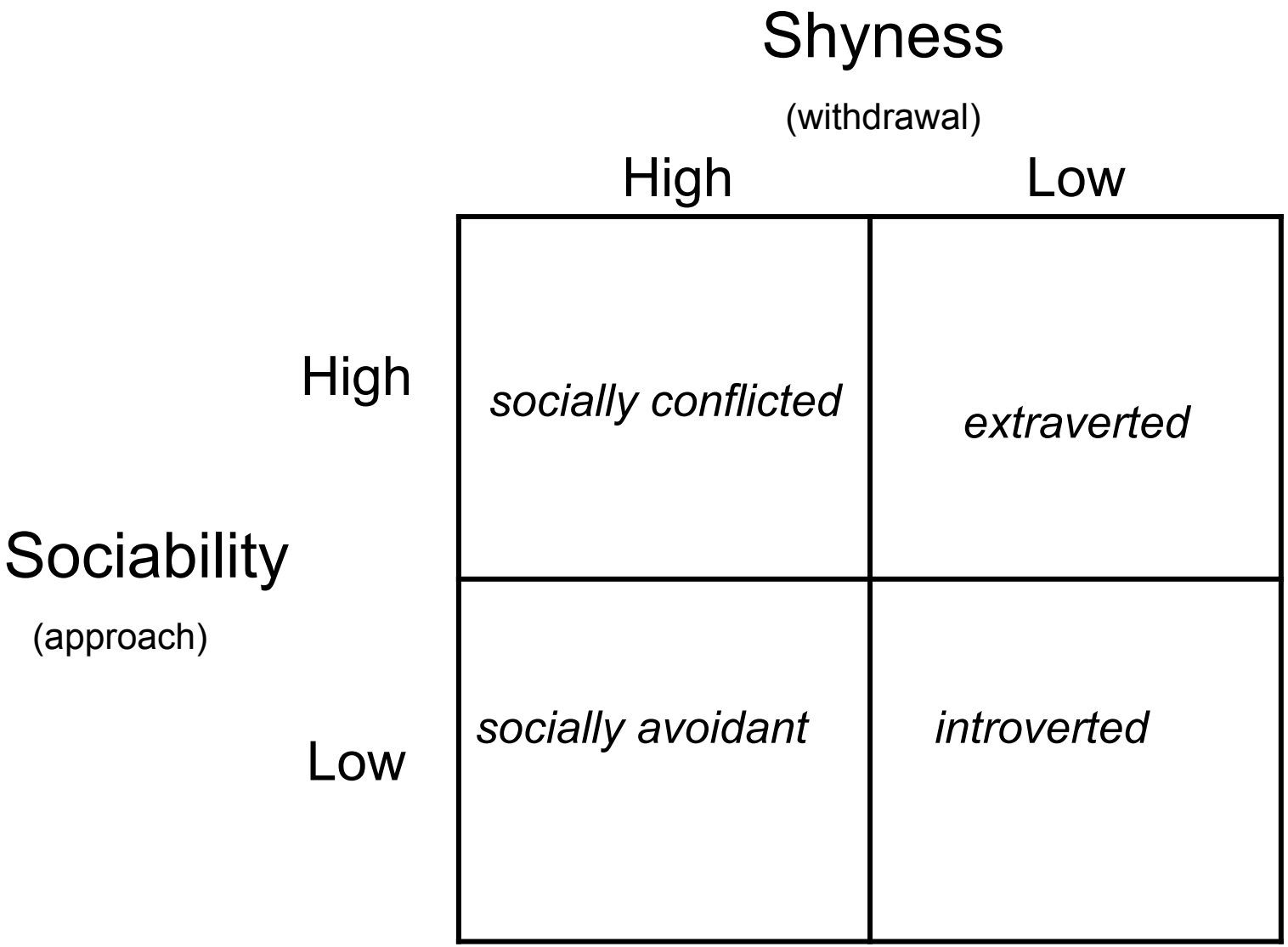
4) If a person is shy, does it make any difference in behaviour whether the person is high or low in sociability?

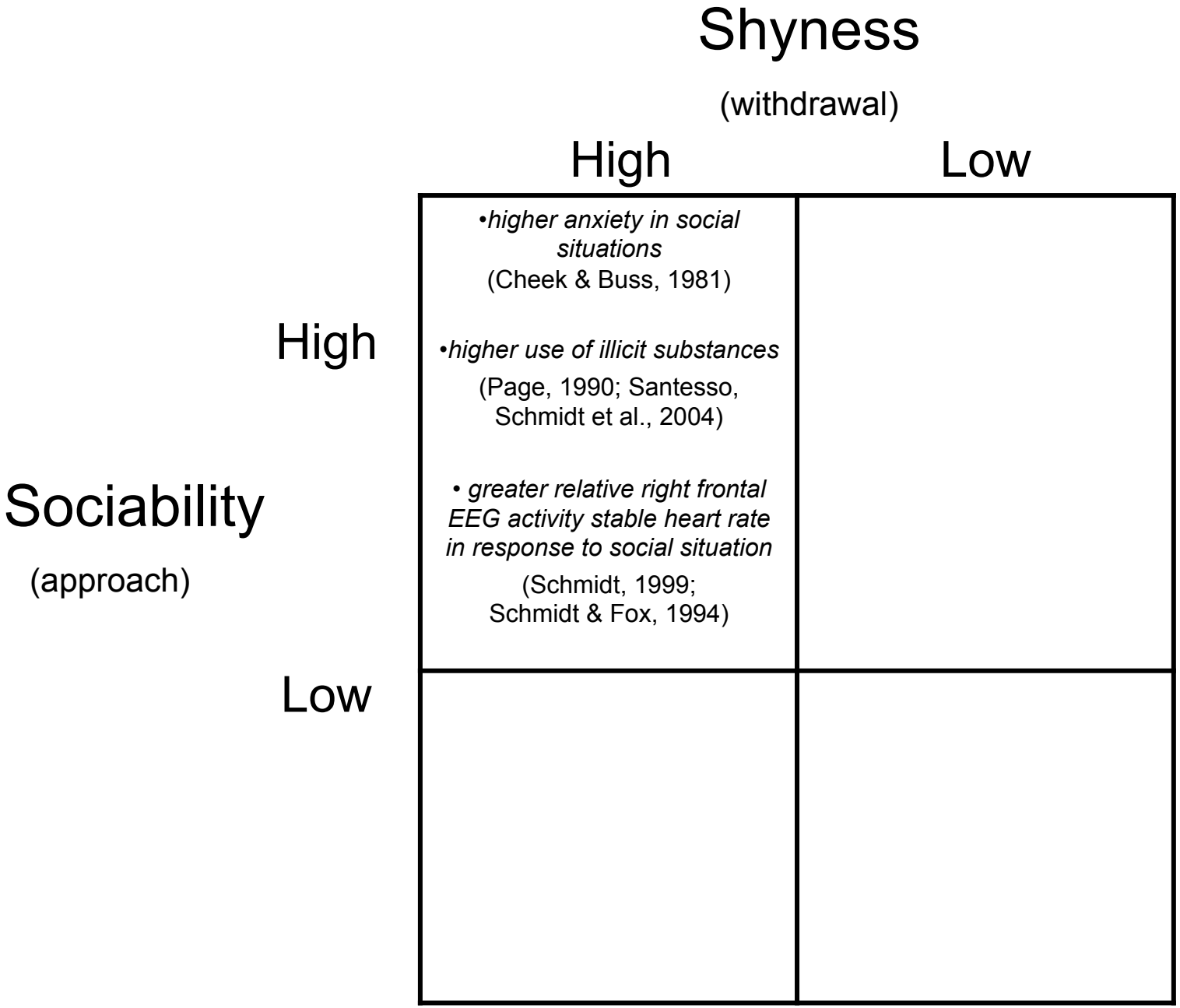


Sample items:

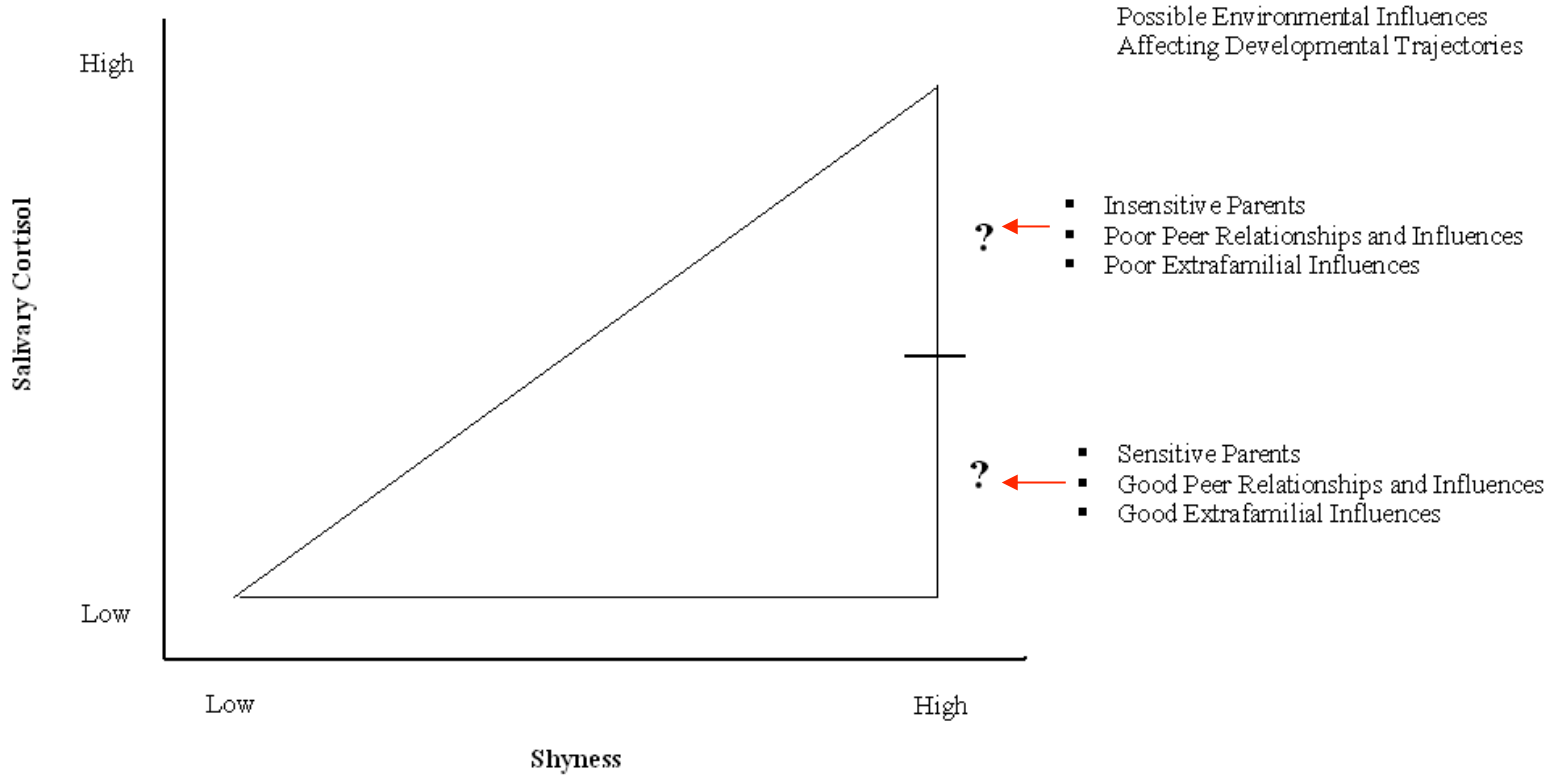
Shyness: “I feel inhibited in social situations”

Sociability: “I like to be with people”


Shyness
(withdrawal)
High
Low
Sociability
(approach)
High
Low
socially conflicted
extraverted
socially avoidant
introverted


Shyness
(withdrawal)
High
Low
Sociability
(approach)
High
Low
•higher anxiety in social situations
(Cheek & Buss, 1981)
•higher use of illicit substances
(Page, 1990; Santesso, Schmidt et al., 2004)
• greater relative right frontal EEG activity stable heart rate in response to social situation
(Schmidt, 1999; Schmidt & Fox, 1994)

Searching for moderating influences



Schmidt, L.A., Santesso, D.L., Schulkin, J., & Segalowitz, S.J. (2007). Shyness is a necessary but not sufficient condition for high salivary cortisol in 10 year-old children. *Personality and Individual Differences*, *43*, 1541-1551.

General conclusions

- Temperamental shyness
  - Stable, distinct behavioural and psychophysiological correlates
  - Interactions with environments conceptualized as conditions within and outside the individual to confer good and bad outcomes
  - Open to change
  - Different types of shy children
  - Agnostic regarding the causal relation between shyness and problem behavior
  - Need to identify moderating factors (e.g., school environments, parenting) and target that level for intervention, affecting positive change and development

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