Life History Theory

In Evolutionary Psychology

Life history theory

How evolution shapes patterns of

- Growth and development

- Reproduction

- Mortality

"A calorie can only be used once" so there are trade-offs:
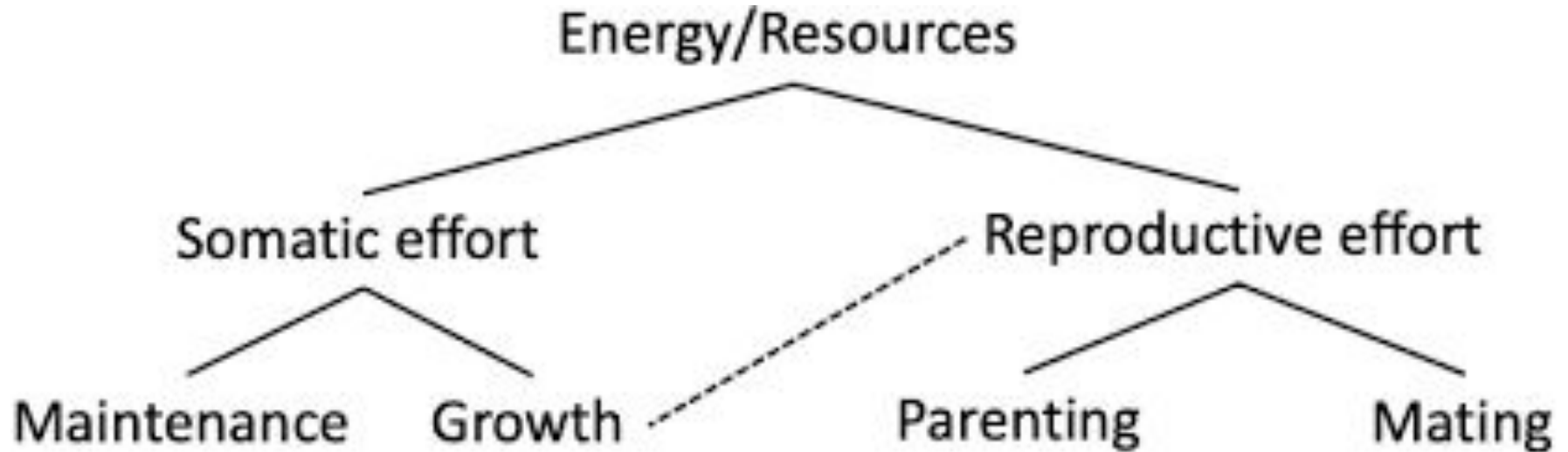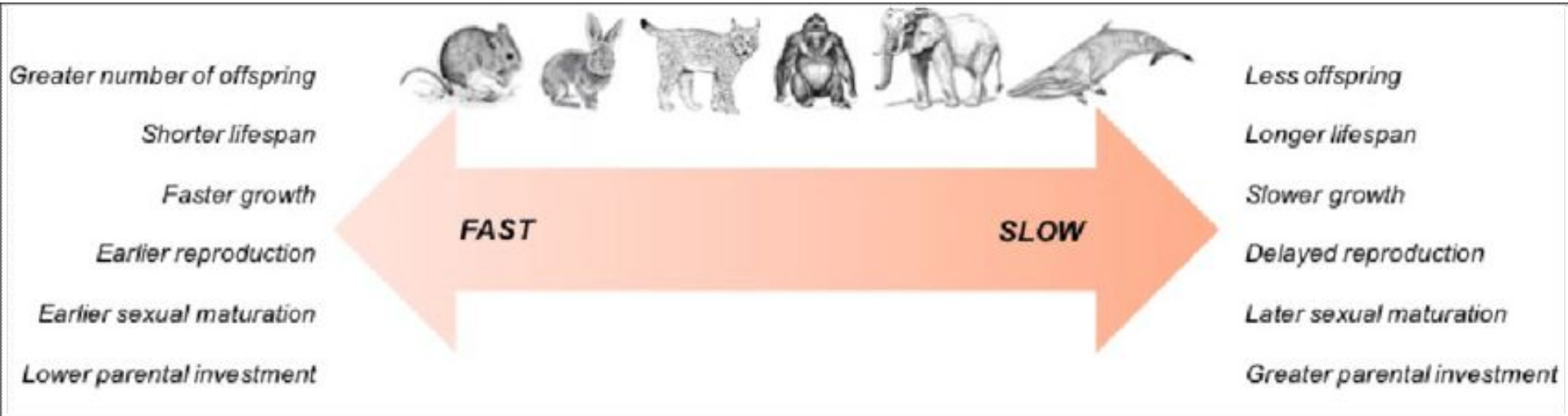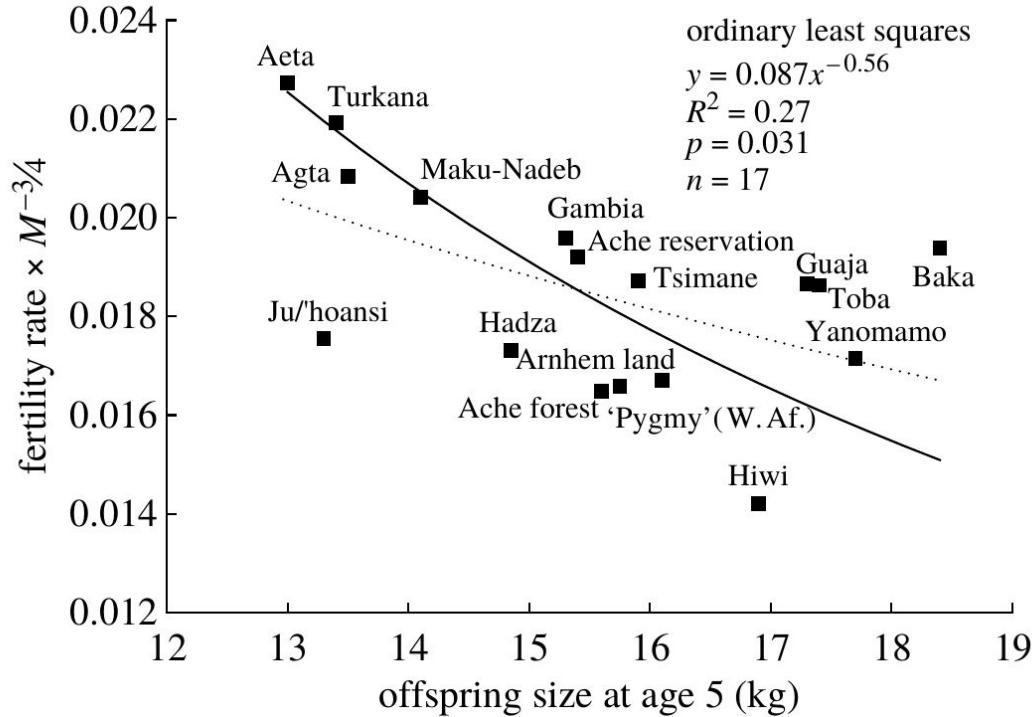
Life history theory trade-offs

Figure from Dan Kruger

Fast vs. slow life histories

Greater number of offspring		Less offspring
Shorter lifespan		Longer lifespan
Faster growth	**FAST**	Slower growth
Earlier reproduction	**SLOW**	Delayed reproduction
Earlier sexual maturation		Later sexual maturation
Lower parental investment		Greater parental investment

Life history tradeoffs (quantity-quality)

Caveat: life-history tradeoffs are hard to demonstrate within populations, because people who have more children also have more resources, so can afford them - and they also have more grandchildren.
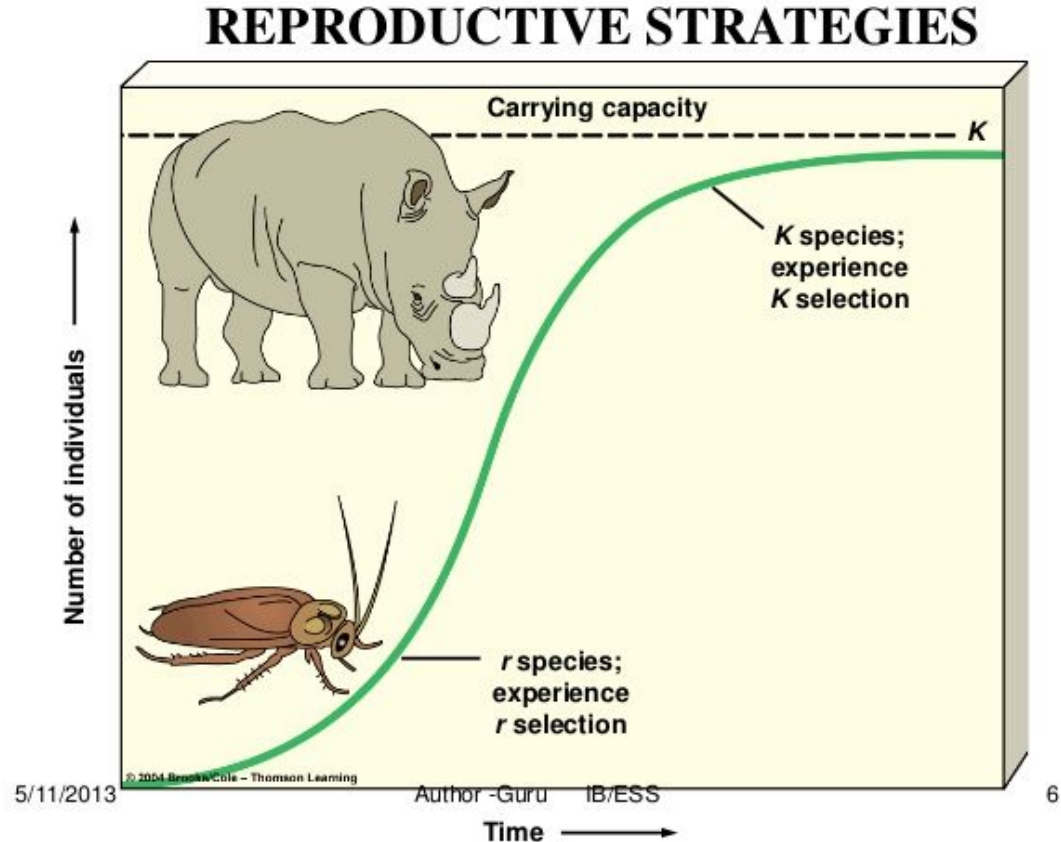
This analysis of natural fertility populations uses an "energy adjusted fertility rate" (fertility is adjusted for mother's body mass).

Walker et al. *PNAS* 2008

An early explanatory theory:

In uncrowded environments, selection pressures favor fast reproduction (maximize "r")

As populations grow and mortality becomes more density-dependent, selection pressures shift from traits that maximize reproduction (r) to traits that favor competition in crowded environments (K).

The theory took some empirical hits, and is no longer used in biology. But still useful to think in terms of fast vs. slow life history strategies, and EP sometimes uses these terms (r & K)

REPRODUCTIVE STRATEGIES

Carrying capacity ————————————————— K

K species; experience K selection

Number of individuals →

r species; experience r selection

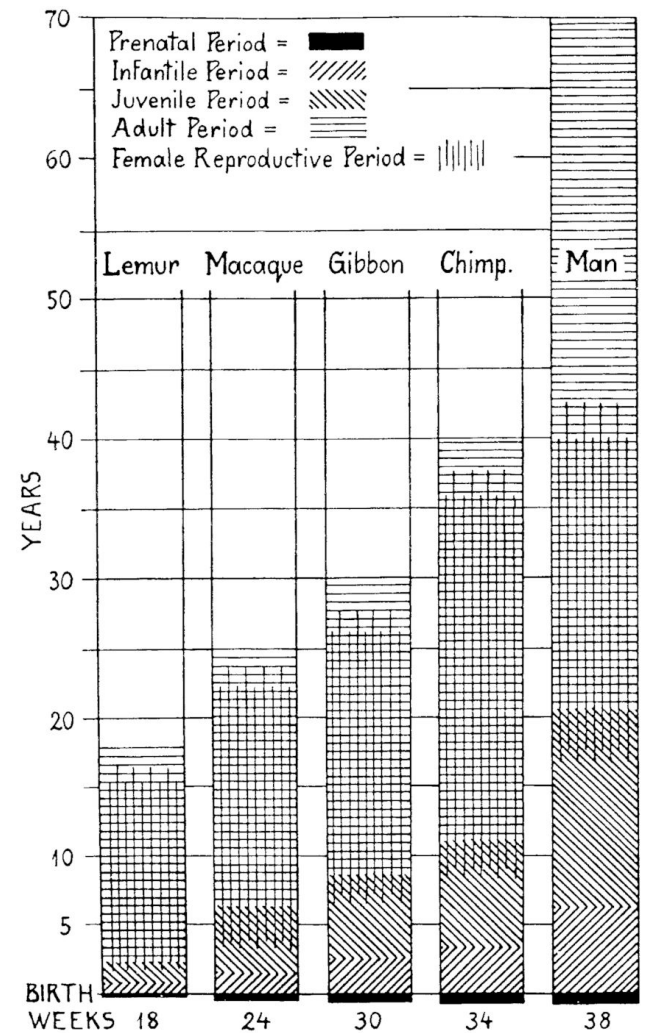© 2004 Brooks/Cole – Thomson Learning

Time →

Life history theory in biology and anthropology

Focus in biology is chiefly on inter-species differences. In anthropology, chiefly on explaining the unusual life history traits that all human share:

- long childhood
- long lifespan
- Menopause

And on how fertility varies cross-culturally

Life history theory in evolutionary psychology

Focus is on intra-specific (individual) differences among humans, and the psychological traits that would favor fast vs. slow life histories:

- Age of first reproduction
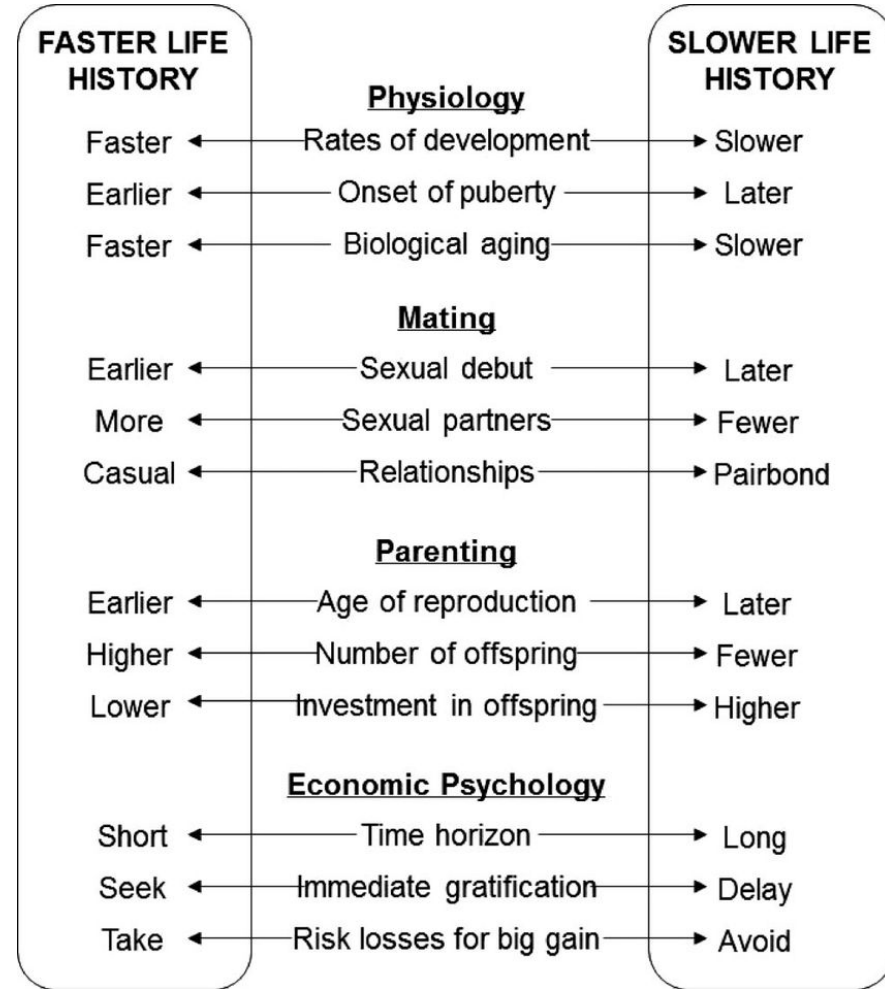- Interest in uncommitted sex
- Risk-taking
- Time horizon

Figure from Ellis et al 2011

FASTER LIFE HISTORY		SLOWER LIFE HISTORY
Physiology		
Faster	Rates of development	Slower
Earlier	Onset of puberty	Later
Faster	Biological aging	Slower
Mating		
Earlier	Sexual debut	Later
More	Sexual partners	Fewer
Casual	Relationships	Pairbond
Parenting		
Earlier	Age of reproduction	Later
Higher	Number of offspring	Fewer
Lower	Investment in offspring	Higher
Economic Psychology		
Short	Time horizon	Long
Seek	Immediate gratification	Delay
Take	Risk losses for big gain	Avoid

Risk-preference and Time-preference

Risk: "would you prefer $10 for sure, or 50% chance of getting $20 or nothing?"

Time discounting: "would you prefer $10 now, or $20 later?"

Risk-preference and Time-preference

Why do some people take risks and live for the present...while others avoid risks and save for the future?

Risk-preference and Time-preference

Why do some people take risks and live for the present...while others avoid risks and save for the future?

'I say fuck tomorrow. It's all about today. Might not be a tomorrow. Might get shot. Might get hit by a bus. So get it now. Now, now, now. Next week might as well be next century. Fuck next week. Fuck tomorrow' (offender named Blue Eyes, age 23 (from Frankenhuis et al. 2016)

"If you got it today you don't want it tomorrow, man, cause you don't need it, cause as a matter of fact, as we discovered in the train, tomorrow never happens, it's all the same fucking day, man. "   (Janis Joplin)

Predictors of life history traits

Within evolutionary psychology, focus has been on:

- Environmental harshness (mortality cues)

- Unpredictability (consistency of harshness between time periods)

- Resource scarcity (resource availability and competition)

What would you expect?

Theorized that people calibrate their life histories during a sensitive period in childhood - early environments shape later expectations.

Life expectancy and life history traits

"life expectancy may be a psychologically salient determinant of risk taking and the timing of life transitions."

Chicago neighborhoods, 1988-93. Male life expectancy *with homicide deaths removed* predicts the homicide rate.

Also: As life expectancy declines across neighbourhoods, women reproduce earlier. Median age giving birth: 22.6 years vs 27.3 years for 10 neighborhoods with lowest vs highest life expectancy.

$r = -0.88, P < 0.0001$

Wilson & Daly, *BMJ* 1997
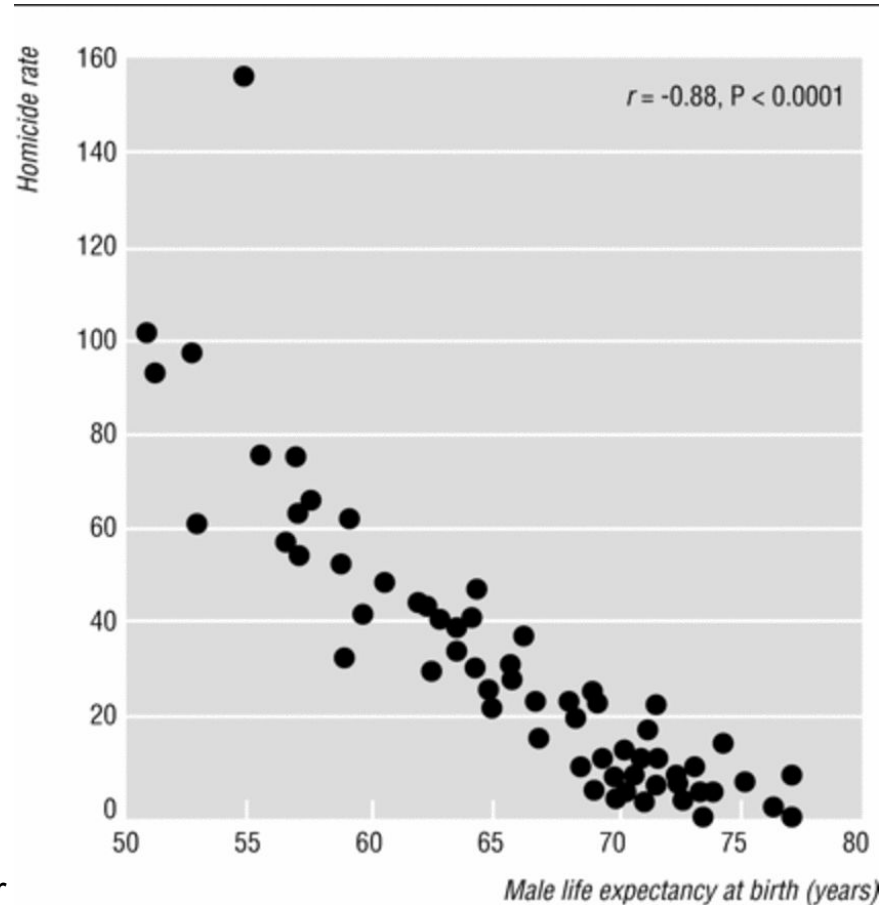
Resource scarcity, mortality cues, and risk

"Mortality threat":

Participants read an article formatted like a *New York Times* web story titled "Dangerous Times Ahead: Life and Death in the 21st Century." Described recent trends toward violence and death in the United States, concluding that these trends reflected the reality of the future environment, which would be treacherous.

The control article had identical formatting and font, with similar length (approximately 600 words). It described a person searching for his lost keys over the afternoon.
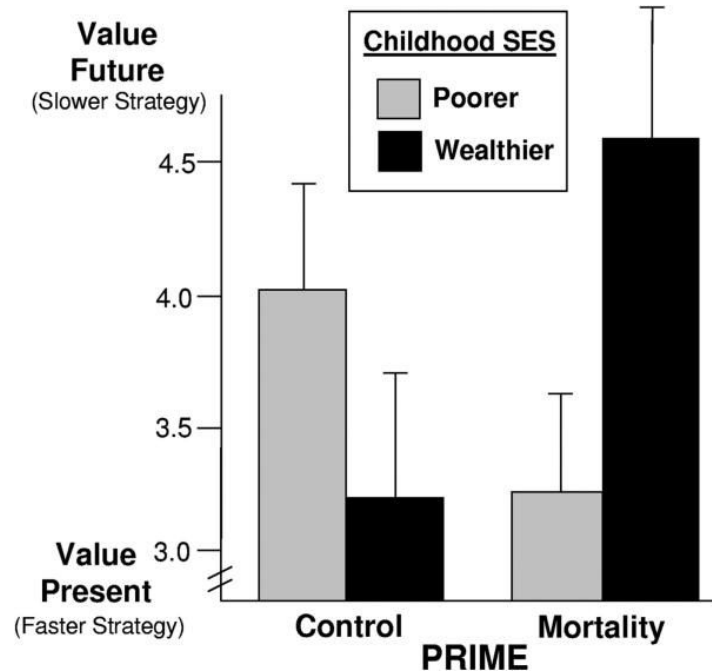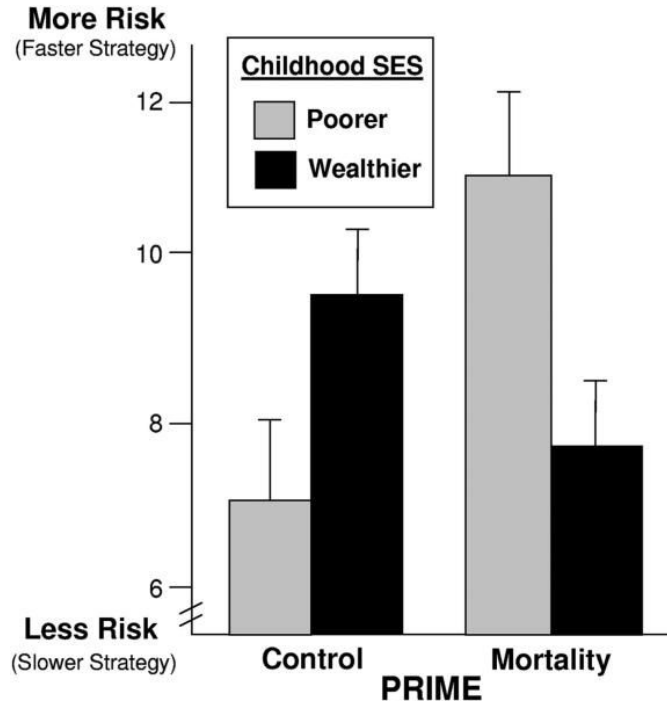
Risk Index:

"Do you want $_____ for sure OR a 20% chance to get $1,000?" (21 options, from $20 to $550)

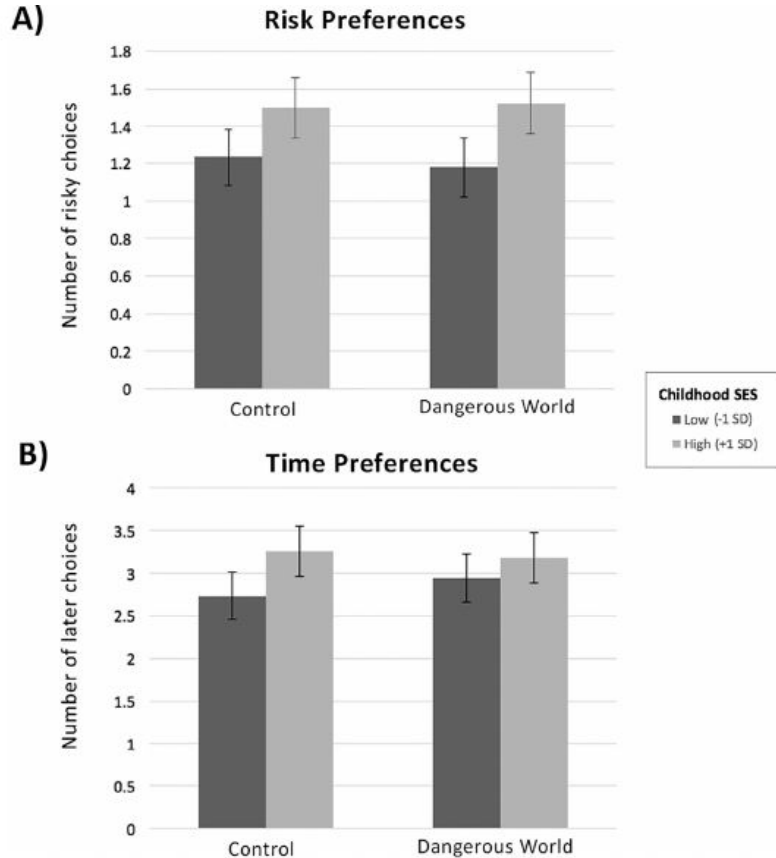"Do you want $_____ for sure OR an 85% chance to get $1,000?" (21 options)

Time Discounting:

"Do you want to get $100 tomorrow OR get $_____ 90 days from now?" (10 options)

Griskevicius et al. J. *Pers. Soc. Psychol.* 2011

Resource scarcity, mortality cues, and risk

For people who grew up poor: mortality cue led them to value the present and gamble for big immediate rewards.
For people who grew up wealthier: mortality cue led them to value the future and avoid risky gambles. Early experience shapes later responses.

Griskevicius et al. J. *Pers. Soc. Psychol.* 2011

Resource scarcity, risk-taking, & time preference

A) **Risk Preferences**
Number of risky choices — Control, Dangerous World
Childhood SES: Low (-1 SD), High (+1 SD)

B) **Time Preferences**
Number of later choices — Control, Dangerous World

In this study, people who grew up poor preferred immediate rewards but the safer option in both cases.

SES = "socioeconomic status"

Risky choices: "Do you want a 50% chance of getting $800 or get $____ for sure?" (from 100-700, risky choices summed)

Time preference: "Do you want to get $100 today or $____ 90 days from now? (from 110-170, larger numbers summed)

Amir et al. *J. Exper. Soc Psych.* 2018

Cognitive adaptations to stressful environments

Growing up in stressful environments is thought to be bad news: from the assigned reading (Mittal et al.)

"People who grow up in stressful environments tend to score lower on tests of intelligence, memory, and other important cognitive abilities. This reduced performance is often assumed to imply that exposure to early life stress impairs general mental functioning."

Q: Are the cognitive differences a deficit in functioning, or a reaction norm?

The study

Executive function: selecting and monitoring behavior so as to attain chosen goals -- includes attentional control, inhibition, working memory, & cognitive flexibility.

Two predictors:

- Harshness of early life (socioeconomic status)
- Unpredictability of early life (chaotic, folks moving in and out etc)

Two outcomes:

- Inhibition (overriding dominant responses)
- Shifting (efficiently switching between different tasks).

People first primed to think of an uncertain economic climate

Uncertainty condition:

Participants read an article formatted like a *New York Times* web story titled Tough Times Ahead: The New Economics of the 21st Century. It described the last economic recession and the highly uncertain economic climate.
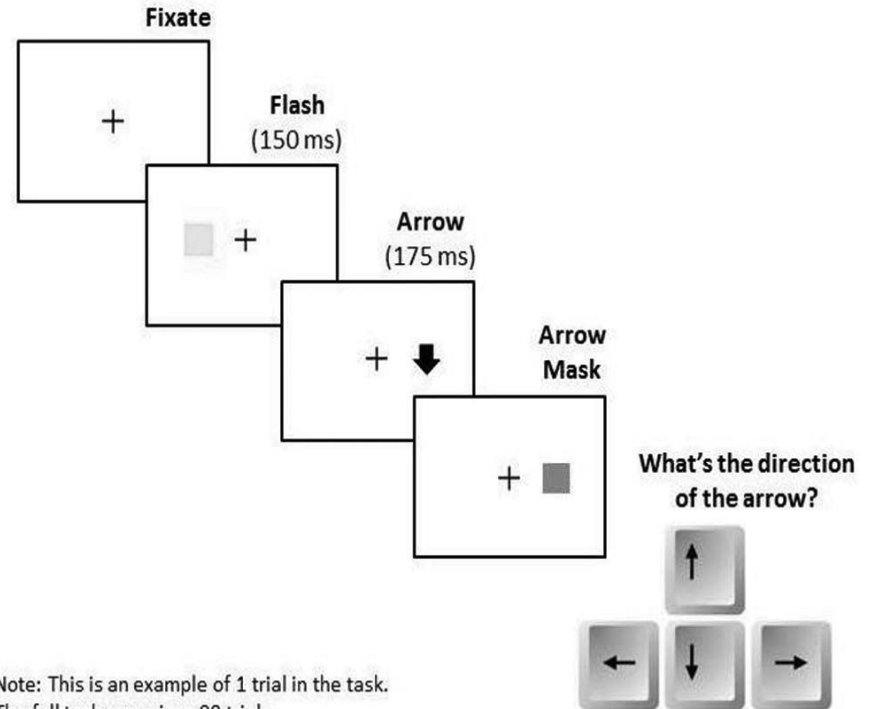
Control condition:

The control article had identical formatting and font, with similar length (approximately 600 words). It described a person searching for his lost keys at home.

Inhibition task:

1. flash grabs attention

2. Arrow (in one of 4 directions) appears on opposite side

3. Arrow is masked

4. Person responds by indicating the direction of the arrow.

The flash grabs attention but person needs to ignore or inhibit it to note the direction of the arrow. Measure was % of correct responses
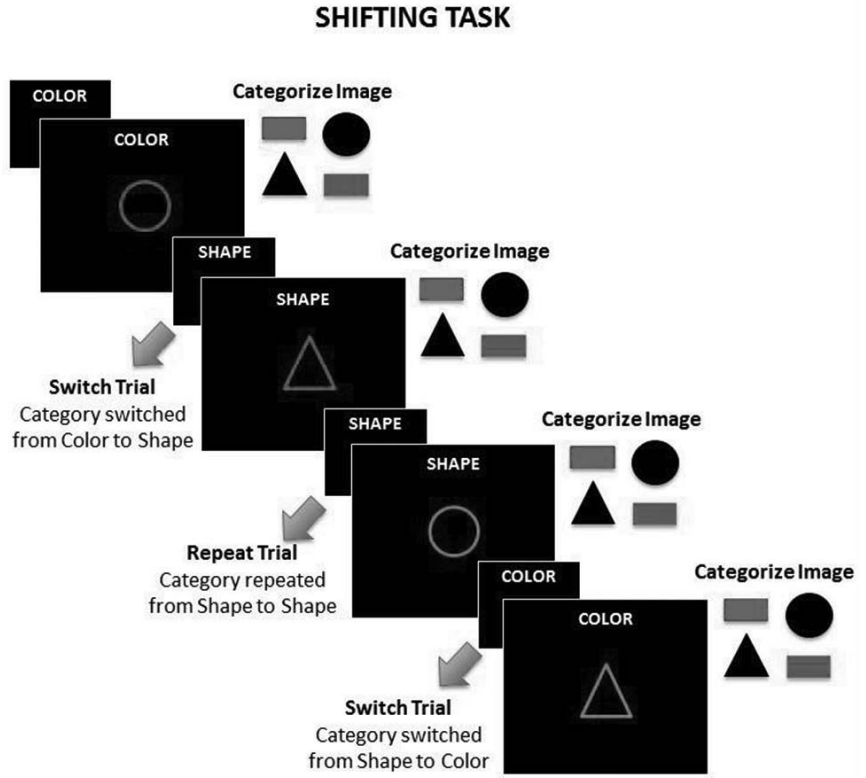
INHIBITION TASK

Fixate

Flash (150 ms)

Arrow (175 ms)

Arrow Mask

What's the direction of the arrow?

Note: This is an example of 1 trial in the task. The full task comprises 90 trials.

Mittal et al. I*nterpersonal relations & group processes* 2015

1. Word 'shape' or 'color' on screen (attend to the following shape or the color)

2. A colored (red or green) shape (triangle or circle) on screen

3. Person must categorize the image by either its shape or its color

(if image is a red circle and the word says 'color', person must respond 'red')

Some trials repeated previous category (shape/color), others switched. Measure was speed of responding to switch trials
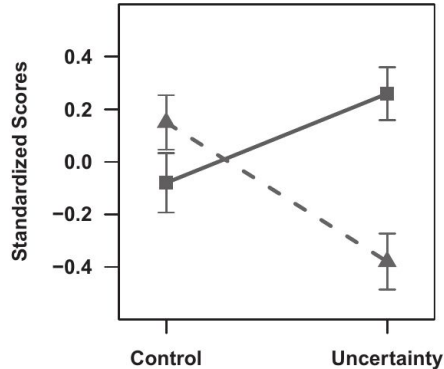
Shifting Task

SHIFTING TASK

COLOR — COLOR — Categorize Image

SHAPE — SHAPE — Categorize Image

Switch Trial Category switched from Color to Shape

SHAPE — SHAPE — Categorize Image

Repeat Trial Category repeated from Shape to Shape

COLOR — COLOR — Categorize Image

Switch Trial Category switched from Shape to Color

Results - studies 1-3

Inhibition: With the uncertainty prime, unpredictable childhood > worse inhibition (in studies 1-3)
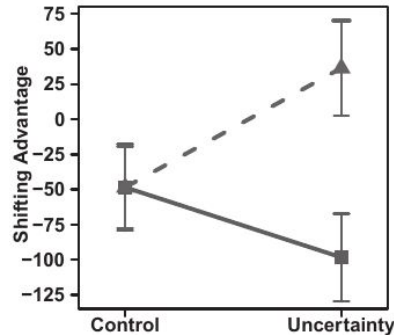
Switching: With the uncertainty prime, unpredictable childhood > faster shifting, and no less accuracy in studies 1 & 3, not study 2.

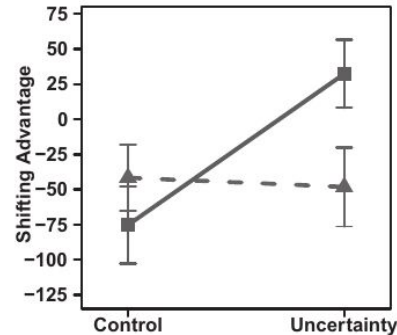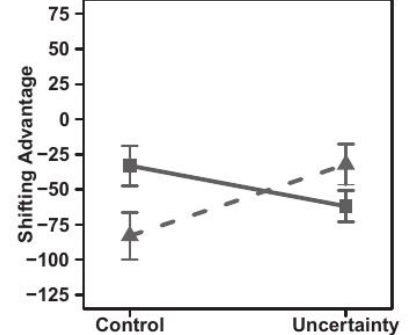Studies 1−3 Combined: Inhibition (N=342)

Study 1 (N=103)

Study 2 (N=58)

Study 3 (N=181)

The research process

- Note the comparatively low "p-values" in the early studies

- after failure to replicate switching result in study 2, did a larger sample in study 3 to get more statistical power

- Followed (study 4) by longitudinal study in a community with contemporaneous data and more extreme variation to nail down the switching result.

# Study 4: Longitudinal study of a community sample

Some design changes:

- Prime was a slideshow of worsening economic conditions

- Childhood unpredictability measured longitudinally by mother's change of employment, change of residence, and people moving in and out.

- Outcome measure was speed on switch trials relative to repeat trials

Study 4: Community Sample, Prospective Childhood Measures (N=51)
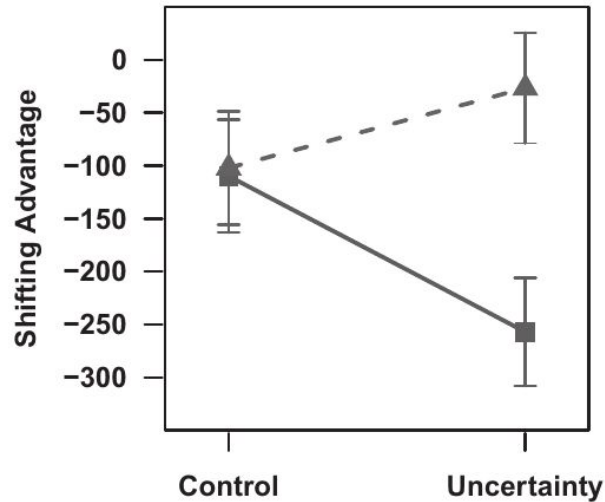
Studies 1−4 Combined: Shifting (N=393)
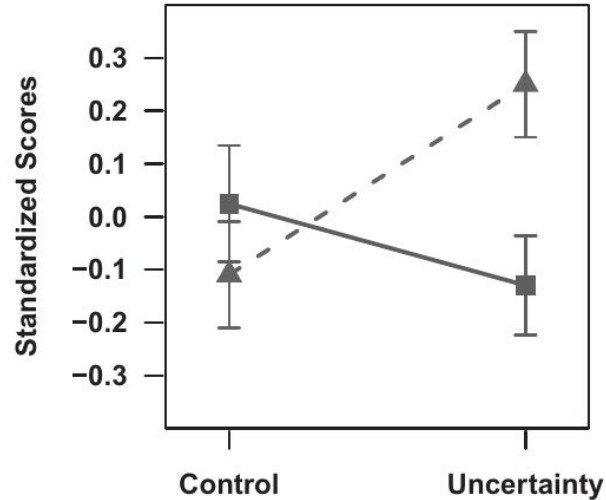
Childhood Environment

▪— Predictable
▲— Unpredictable

- Childhood harshness did not affect switching performance

- In the uncertainty condition, greater unpredictability during childhood predicted significantly better performance on shifting

Concluding thoughts

Fast life history traits are usually thought of as problems to be solved (teen pregnancy, unstable pair bonds, short time horizens, etc)

Evolutionary psychology (and evolutionary anthropology) considers that they may instead be optimal adaptations to life circumstances (high mortality and unpredictable childhoods)

If society wants to change them, therefore, the solution is to change the contexts that favor them.

A big methodological challenge remains separating environmental from genetic effects, since the early environment is shaped by (heritable) parental life history traits