

Cortisol, ethnography and epidemiology - how can we bring these together?

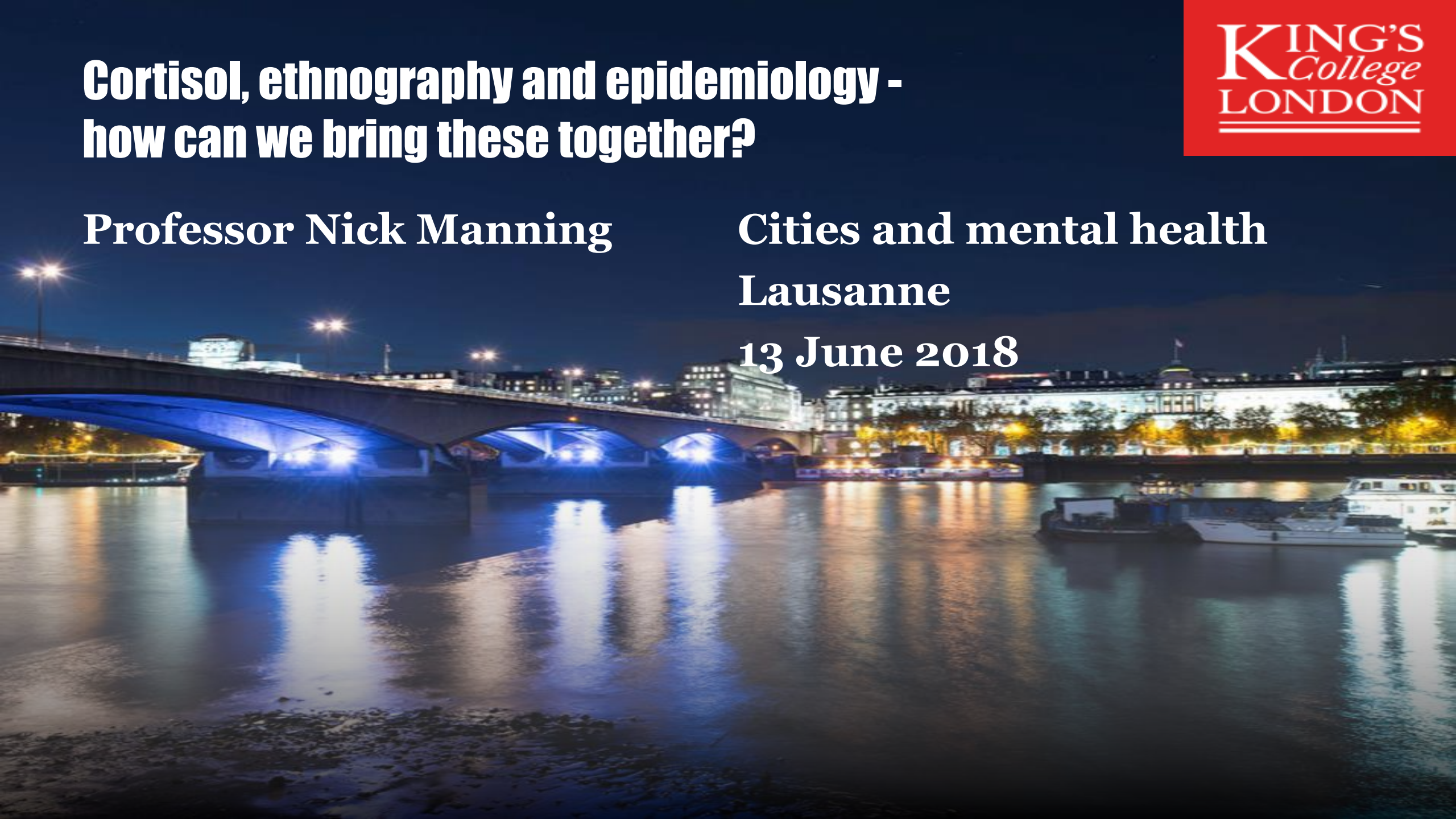
KING'S
College
LONDON

Professor Nick Manning

Cities and mental health

Lausanne

13 June 2018



What happened in Shanghai (2000s-2010s)?

Economic liberalisation

Growth in inequality

Political suppression - containing social dislocation

Land struggles

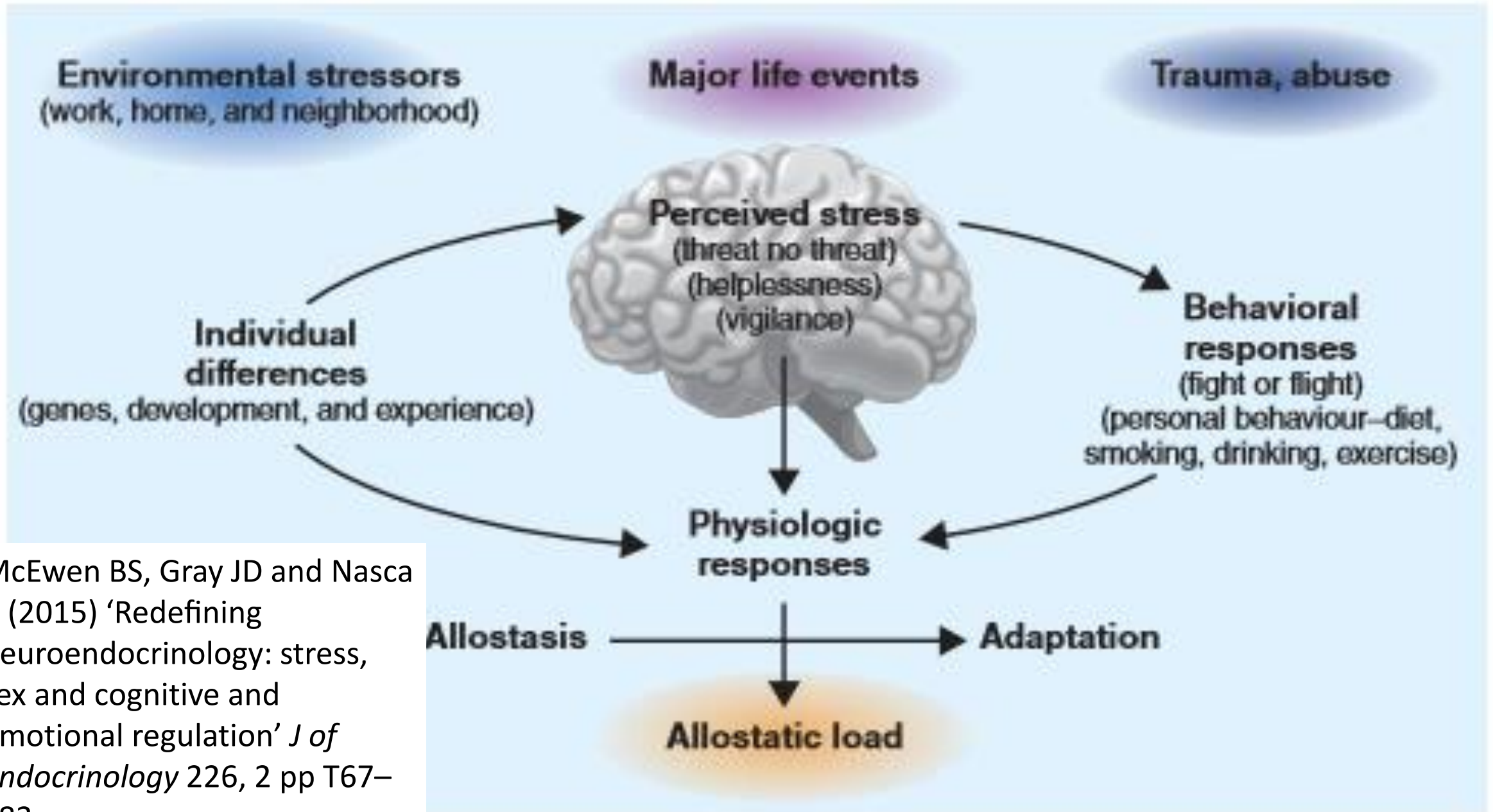
Reduction in poverty

Consequences

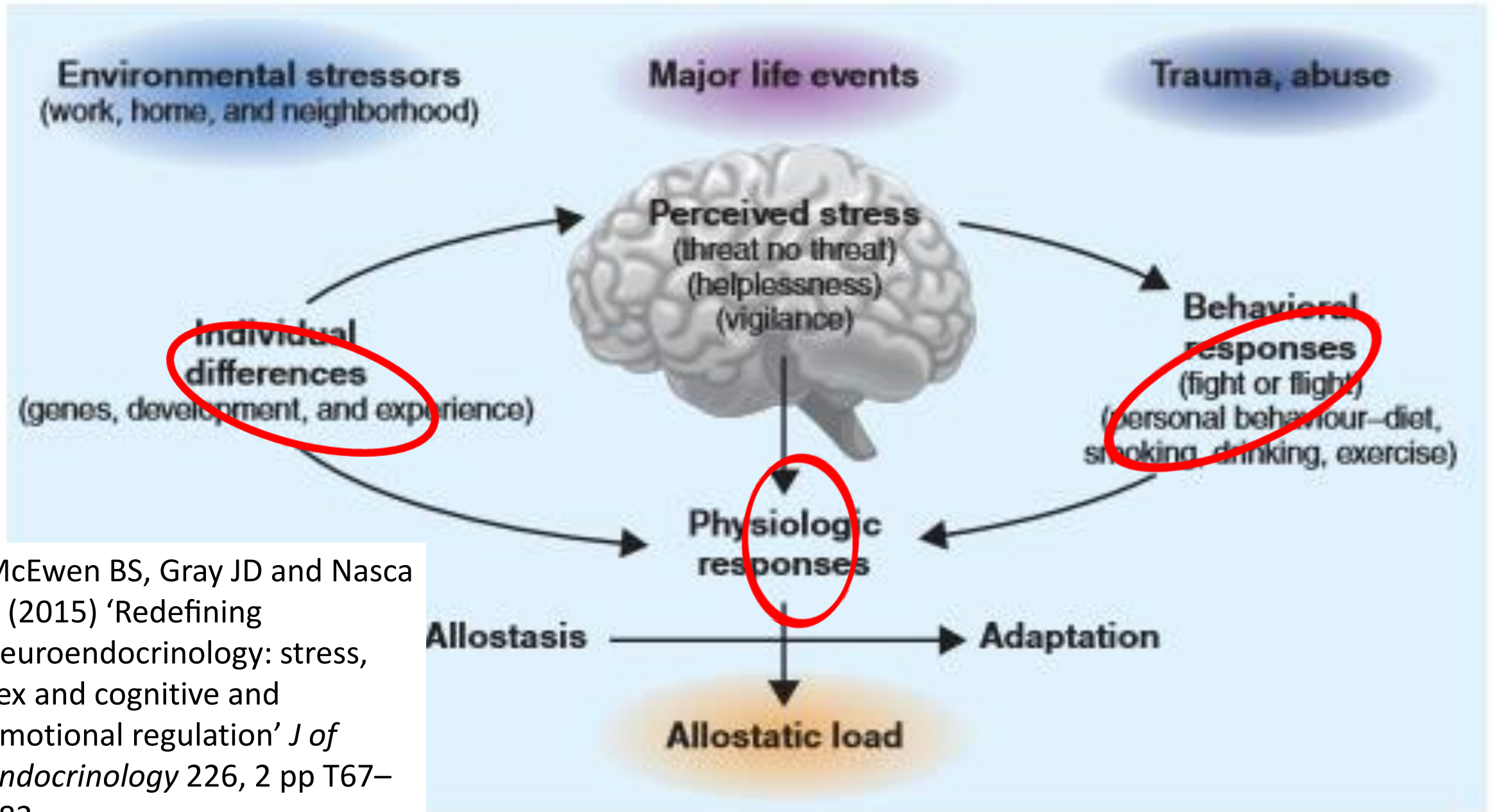
- 1. absence of social movements - spontaneous *labour unrest* perceived by some senior ministers as a problem of ‘mental illness’, eg the numerous suicides at Foxcon**
- 2. *market exclusion*, ‘rat tribes’**
- 3. *new middle class*, from ‘apple core’ to pyramid**
- 4. *Chinese fatalism* - sacrifice is acceptable for the future benefit of the family/village/China**
- 5. Vanity projects (‘Thames Town’), and *sharp conflicts in public perceptions* between social rights and private enrichment**
- 6. *Extensive in-migration* - but recent policy commitment is to cap the city size at around 25 million people**

Shanghai Jiuting

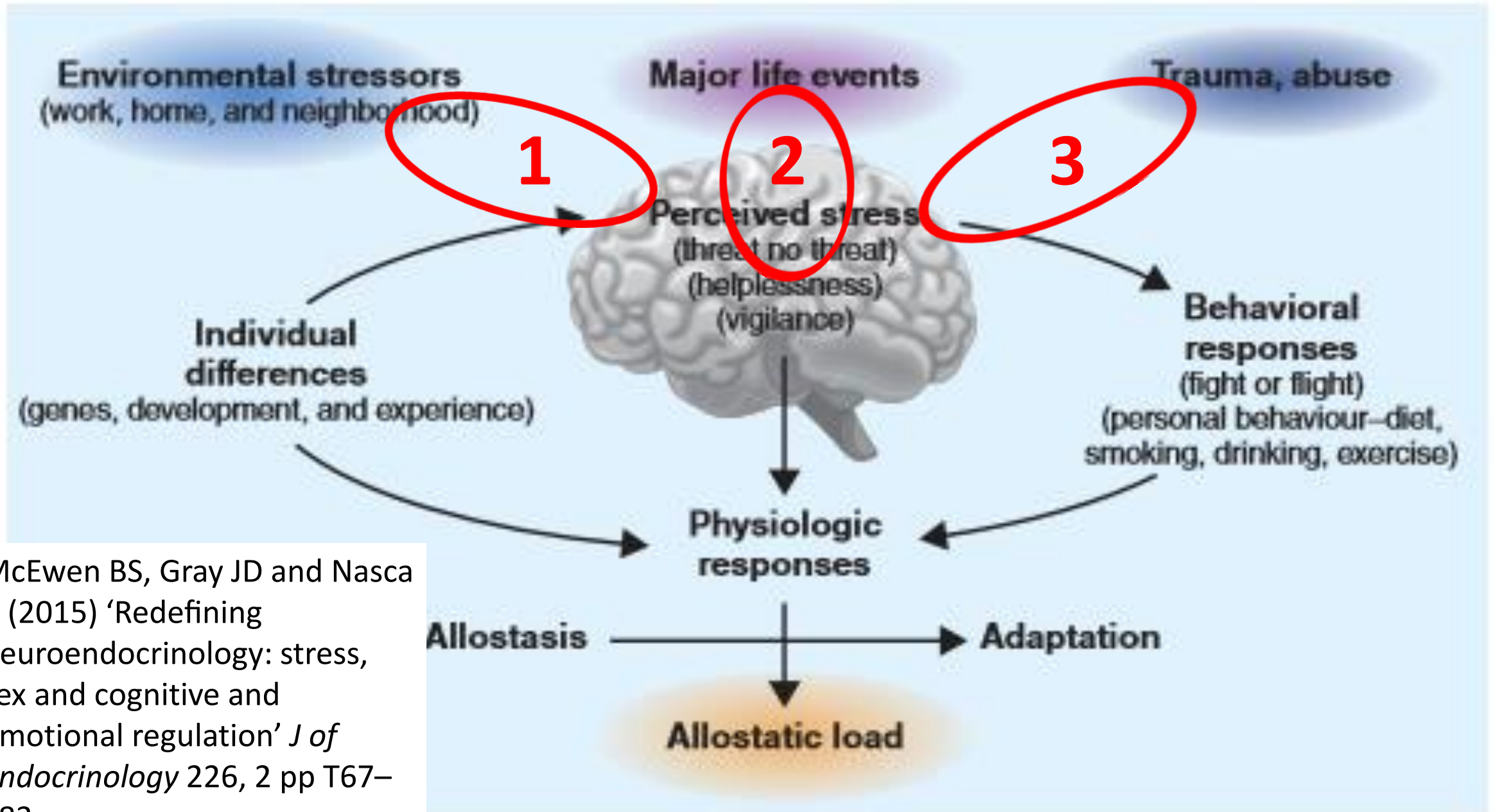




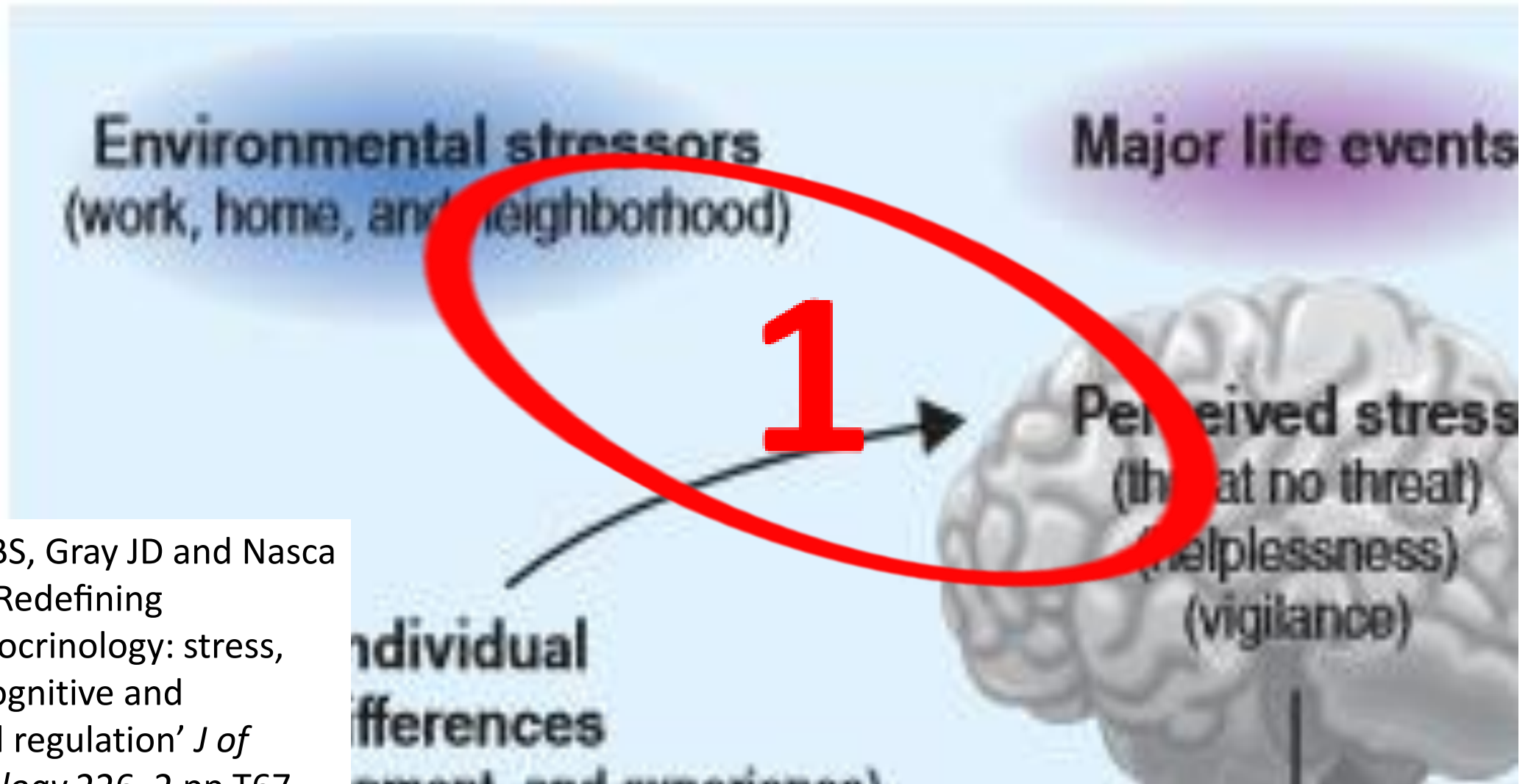
McEwen BS, Gray JD and Nasca C (2015) 'Redefining neuroendocrinology: stress, sex and cognitive and emotional regulation' *J of Endocrinology* 226, 2 pp T67–T83



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Question 1 - What is 'the urban/city/social'?

Epidemiological view

Neuroscience view

(Ethnographic view)

Epidemiological views of the social

Table 1 – social epidemiologies of urban life

Socio-economic status, ethnicity, migration – and their intersection (Goodwin, et al, 2017)

Social disadvantage, isolation and function (Morgan, et al, 2017)

Socio-economic status and social inclusion (Yi and Liang (2017)

Social isolation and social "defeat" (Frissen, et al, 2017)

Social minority status - ethnicity, household, social class (Schofield, et al, 2016)

Social disadvantage (Stilo, 2016)

Social status, social support, and racial discrimination (Mama, et al 2016)

Social networks, social support, and ethnicity (Smyth, et al, 2015)

Social network structure and culture (Perry and Pescosolido, 2015)

Social deprivation, social support, discrimination, stress, trust (Wickham, et al, 2014)

Social coherence, density of social networks, and population density (Lederbogen, et al, 2013)

Social adversity, population density, social fragmentation and deprivation (Heinz, et al, 2013)

Social ties, social support, and stress buffering (Thoits, 2011)

Socio-economic status, social capital, and social disorder (Kim, 2008)

Social fragmentation, social isolation and social inequality (Van Os, 2004)

Neuroscience views of the social

Neural effects of ***urban upbringing and habitation*** on social stress processing in humans – *Nature*, 474, p. 500, 2011

City dwellers typically face more ***noise, crime, slums, people jostling*** in the streets ... growing demands in the workplace – *Nature* 490, p.162, 2012

“toxic stress” – ***poor, or poorly coping, mothers*** should be cared for better while pregnant – *Pediatrics* 129, e224, 2012

Severe stress such as prolonged ***economic hardship or sexual or physical abuse*** - *Nature*, 490, p. 171, 2012

Prolonged threats such as ***War, financial hardship, abuse and emotional neglect*** - *Nature*, 490, p. 170, 2012

A number of possible culprits ... ***noise, pollution and social pressure***, in both the form of greater ***competition*** and ***weaker community ties*** – *Scientific American Mind*, March 1st, p.59, 2013

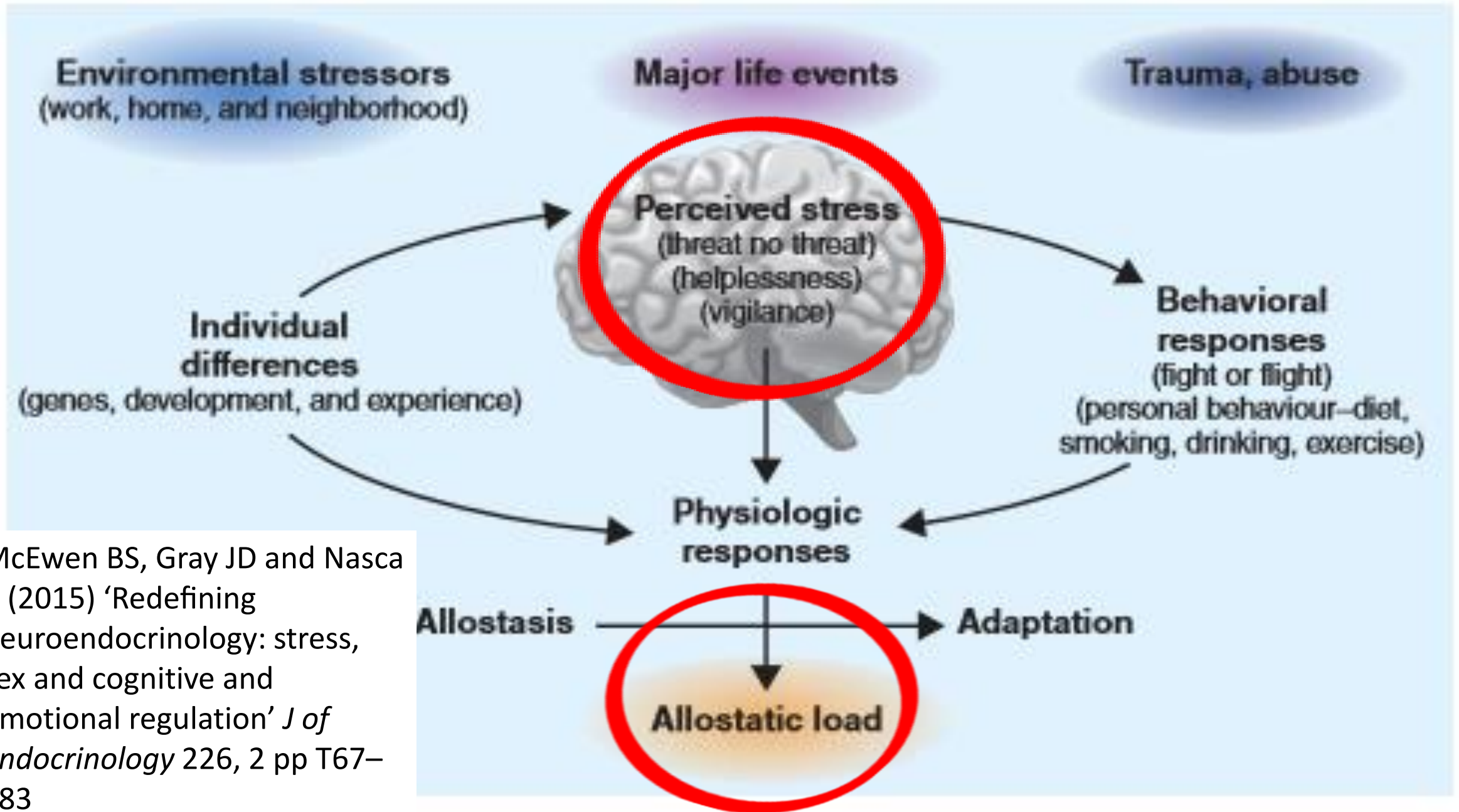
Stress in early life ... early life adversity ... depression, post traumatic stress disorder, and childhood poverty – *Nature Neuroscience*, 18, p.1345, 2015

Question 2 - What is 'stress'?

McEwen – allostatic load

Lederbogen – experimental measurement

“Social” neuroscience – animal studies



McEwen BS, Gray JD and Nasca C (2015) 'Redefining neuroendocrinology: stress, sex and cognitive and emotional regulation' *J of Endocrinology* 226, 2 pp T67–T83

Stress I allostatic load (.... Cortisol)

Dowd, Simanek and Aiello (2009) conclude on the basis of the 26 studies they found that “Current ***empirical evidence linking SES [socio-economic status] to cortisol and AL (allostatic load) is weak.*** Future work should standardize approaches to measuring SES, chronic stress and cortisol to better understand these relationships.” (p 1297).

Dowd JB, Simanek AM and Aiello, AE (2009) ‘Socio-economic status, cortisol and allostatic load: a review of the literature’ *International Journal of Epidemiology* 38, pp 1297–1309. doi:10.1093/ije/dyp277

Stress I allostatic load (.... Cortisol)

Johnson, Cavallaro and Leon (2017) report that a total of 59 different biomarkers were used in one or more of the 26 studies they found. The number of biomarkers used to create an AL index ranged between 6 and 25.

And conclude that “The ***substantial inconsistency*** in biomarkers used to operationalise AL and the ***lack of fidelity to its original conception*** as an index that captures the biological response to psychosocial stress is striking. This suggests that the ***empirical literature on AL is intrinsically flawed and without a strong conceptual basis***. ... This divergence makes it difficult to know what is being measured by AL, let alone interpret findings that examine the association between SEP and AL.” (p 10)

Johnson SC, Cavallaro FL and Leon DA (2017) ‘A systematic review of allostatic load in relation to socioeconomic position: Poor fidelity and major inconsistencies in biomarkers employed’ *Social Science & Medicine* (pre-publication) doi: 10.1016/j.socscimed.2017.09.025

Stress II

.... experimental

Lederbogen, F, et al (2011) 'City living and urban upbringing affect neural social stress processing in humans' *Nature* 474, 498–501.

Steinheuser V, Ackermann K, Schonfeld P and Schwabe L (2014) 'Stress and the City: Impact of Urban Upbringing on the (re)Activity of the Hypothalamus-Pituitary-Adrenal Axis' *Psychosomatic Medicine* 76, pp 678-685

the “**Montreal Imaging Stress Task (MIST)**, a social stress paradigm where participants solve arithmetic tasks under time pressure” (p. 498) and a similar test in which “subjects performed two cognitive tasks (arithmetic and mental rotation) while being continuously visually exposed to disapproving investigator feedback through video” (p. 499).

The **Trier Social Stress Test** asked subjects to “recall a list of 50 previously learned items in front of an audience” (p 679). The **Socially Evaluated Cold Pressor Test** asked subjects to “immerse their right hand up to and including the wrist for 3 minutes (or until they could not tolerate it any more) into ice water.” (p 679)

Trier Social Stress Test



Der Trierer Sozialstress Test (TSST)

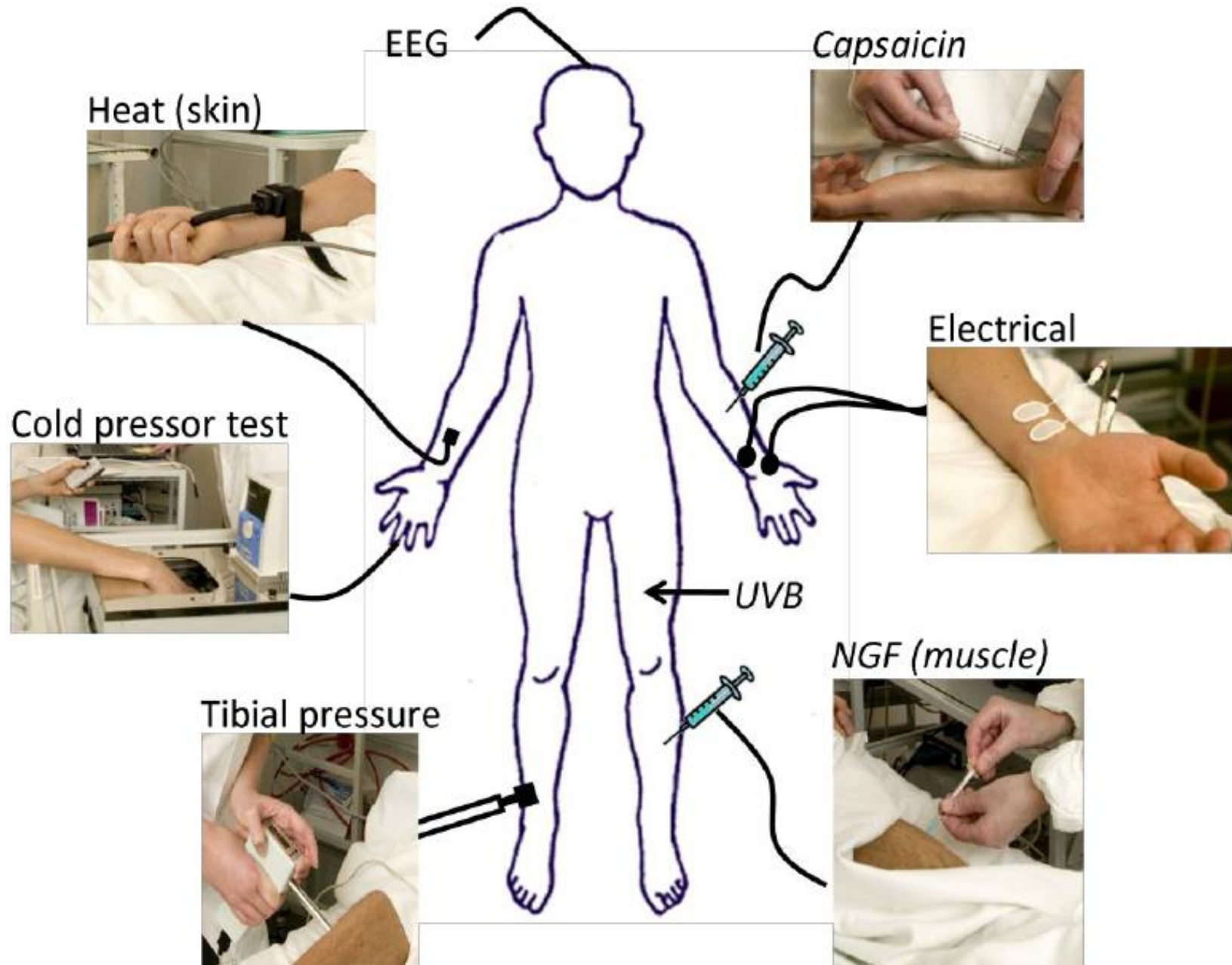
Trier Social Stress Test (TSST)



Cold Pressor Test



Stress II or is it pain?



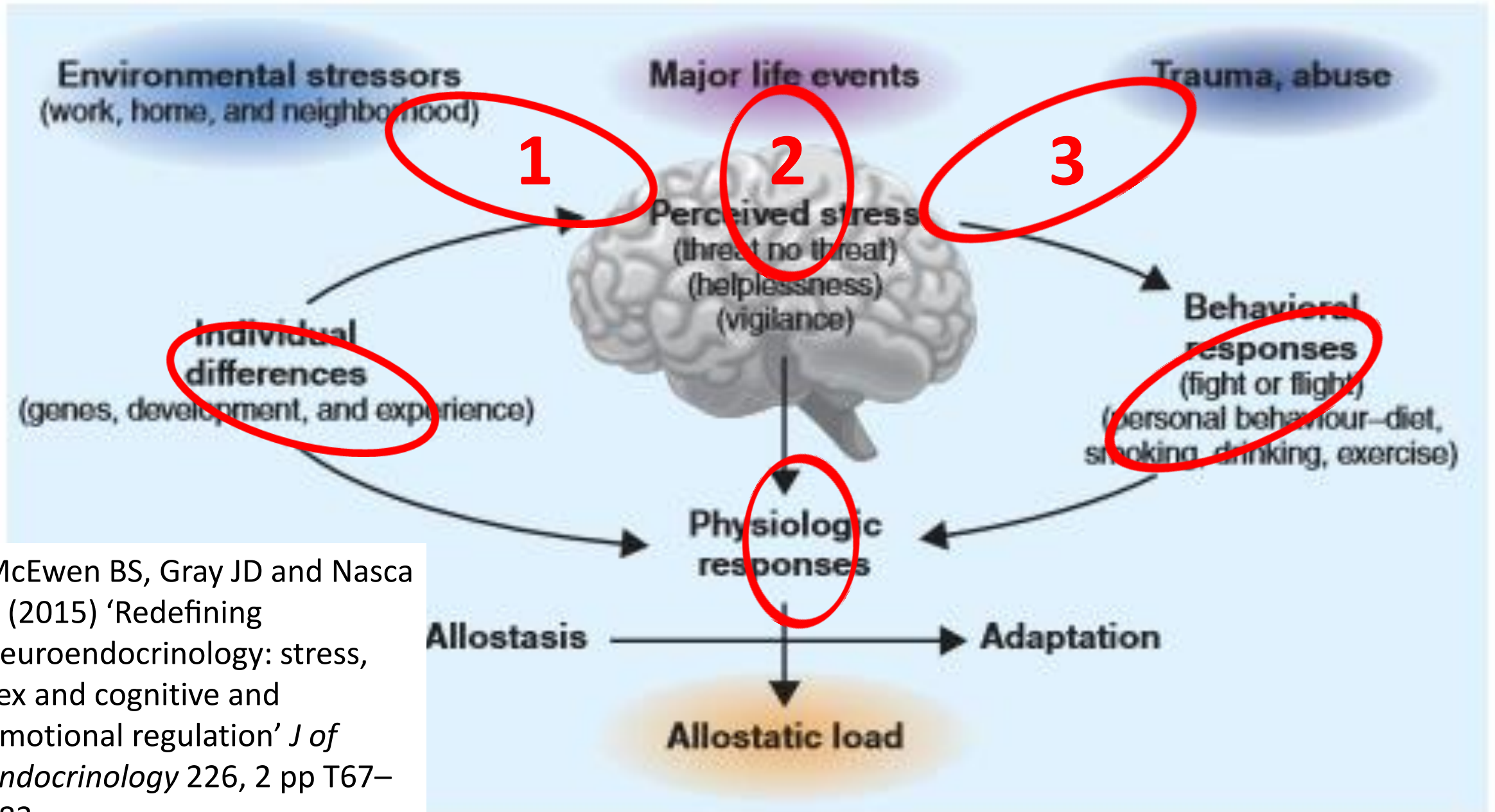
Stress III Social neuroscience - mainly animal studies

“Stress (**defined in this Review as the activation of the neurophysiological stress response**) helps organisms to cope” (p 290).

“If stress that is caused by social disputes — such as war, physical abuse or **aberrant socioeconomic inequalities** — exacerbates antisocial dispositions in individuals, it may be instrumental in the development of **spirals of violence**” (p. 300)

Sandi, C and Halle, J (2015) ‘Stress and the social brain: behavioural effects and neurobiological mechanisms’ *Nature Reviews Neuroscience* 16, 290–304, doi:10.1038/nrn3918

Question 3 - What are the mechanisms?

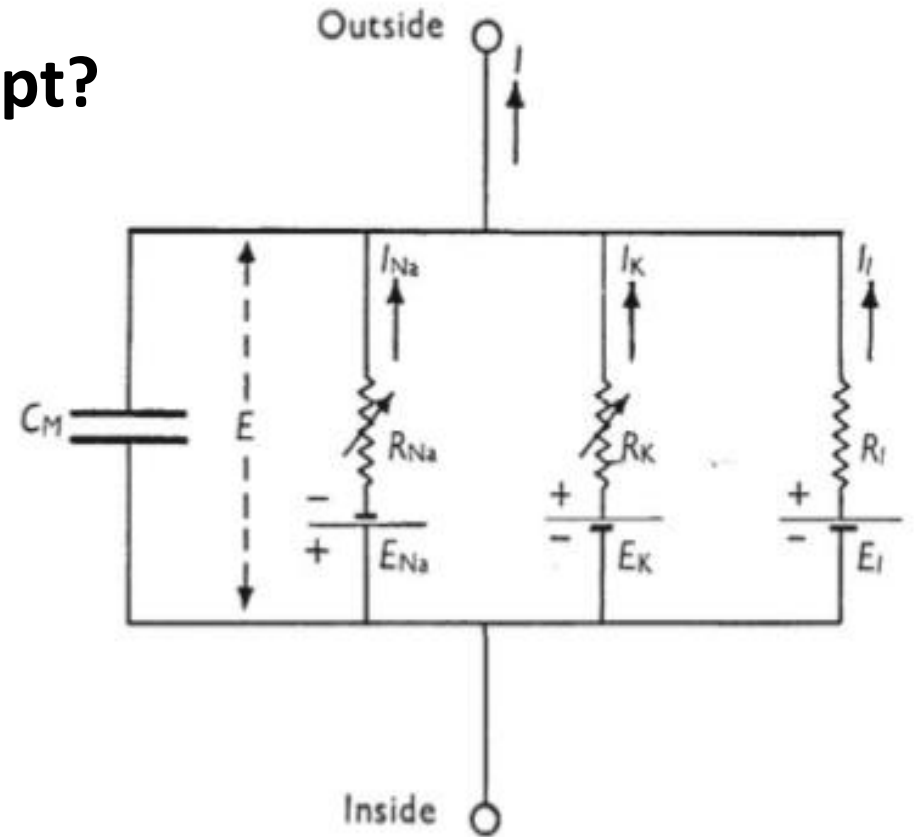


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Mechanisms – can this be the bridge concept?

Hodgkin and Huxley (1952) on the way in which squid neurons fire signals from nerve cell to nerve cell via electro-chemical mechanisms

$$\frac{a}{2\pi\theta^2} \frac{d^2V}{dt^2} = C_M \frac{dV}{dt} + g_K n^4 (V - V_K) + g_{Na} m^3 h (V - V_{Na}) + g_I (V - V_I),$$



Schaffner KF (2008) 'Theories, Models, and Equations in Biology: The Heuristic Search for Emergent Simplifications in Neurobiology' *Philosophy of Science*, 75 pp. 1008–1021.

Ray Pahl's urban sociology – mechanisms of the urban, or tilting at windmills?



1960s - Urbs in rure “some people are in the city but not of it, whereas others are **of the city** and not in it” (Pahl, Urbs in Rure, 1965; 1966, p. 299)

1970s - Urban managers versus markets - **hukou**

1980s - Formal and informal work - **precarity**

1990s - friends and families – **social capital**

For example 1: Lederbogen, F, et al (2011) 'City living and urban upbringing affect neural social stress processing in humans' *Nature* 474, 498–501

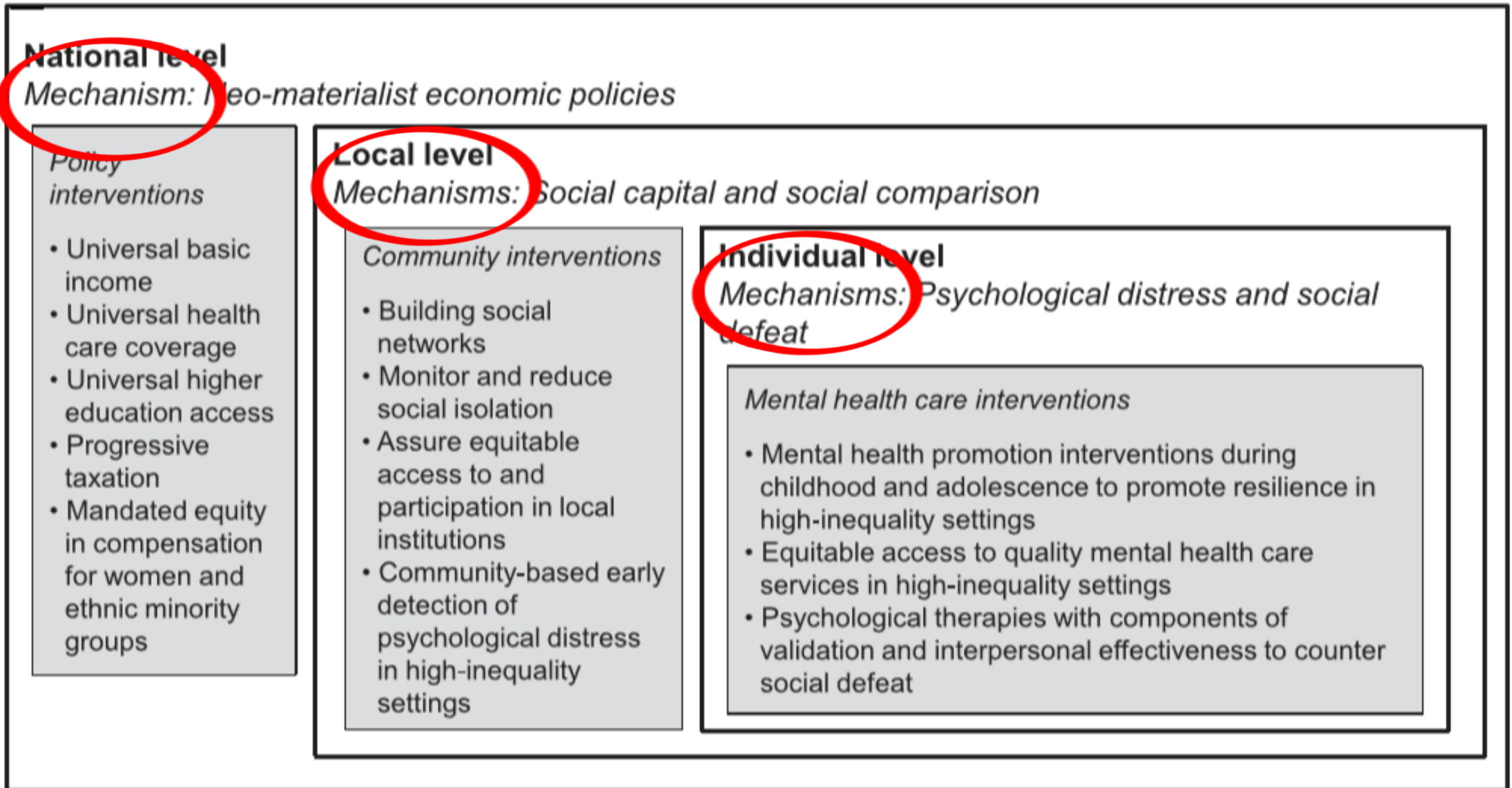
conclude with the “parsimonious proposal that ***social stress*** contributes causally to the impact of urbanicity on the neural circuits identified” (p. 500).

In a final flourish, they suggest that:

“Beyond mental illness, our data are of general interest in showing a link between cities and ***social stress*** sensitivity. This indicates that an experimental approach ... could be used to characterize further ... the effects of finer-grained quantifiers of individuals' ***social networks*** or individual ***social experience in urban contexts***. One such potential component is ***unstable hierarchical position***.” (p 500, italics added).

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For example 2: Patel, V et al (2018) 'Income inequality and depression: a systematic review and meta-analysis of the association and a scoping review of mechanisms' *World Psychiatry* 17:1 pp76-89



Question 4 – Where next?

What kind of data do we need now?

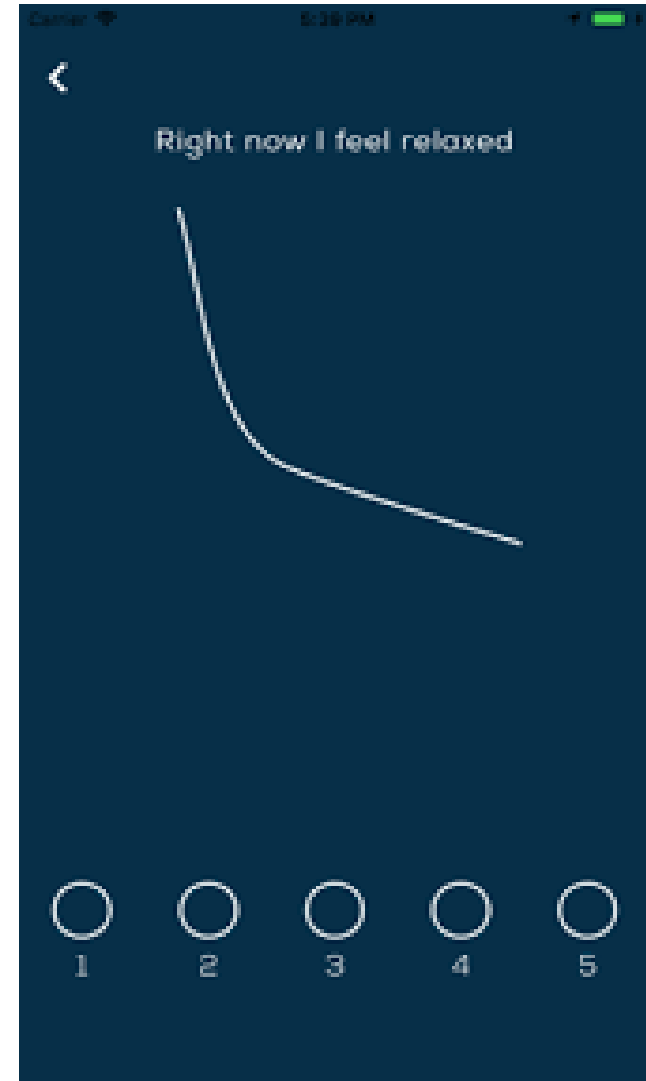
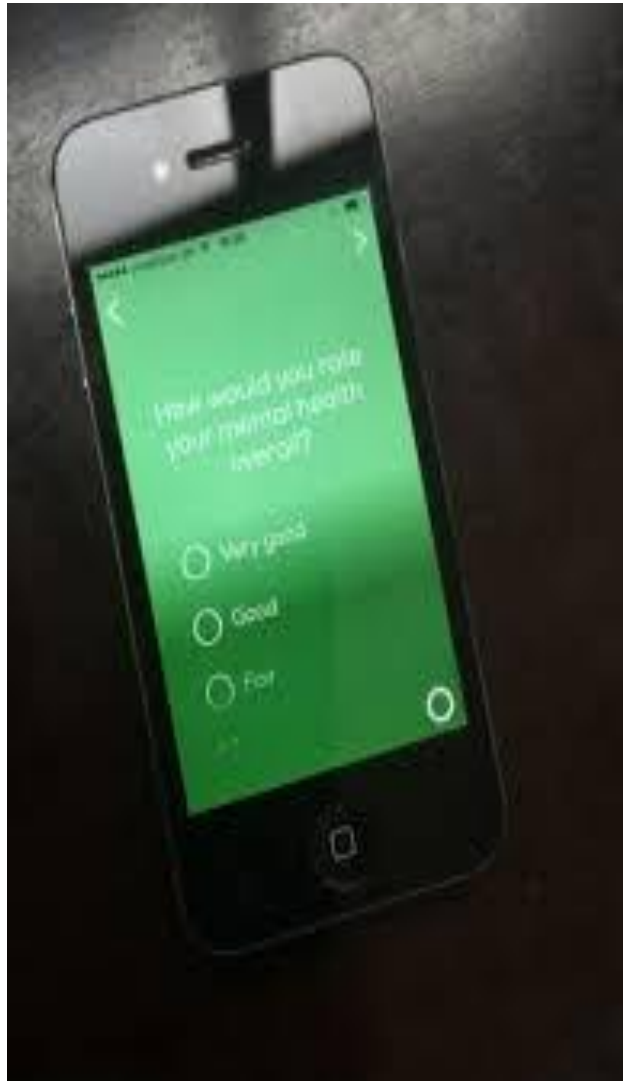
Data 1 - ethnography

Ash and Lisa's work

“How might ethnography help complicate common assertions about the relationship between everyday social stress and mental ill health?”

- the city/urban/social**
- lived experience and everyday social stress**
- social practices**
- urban atmospheres**
- common affordances**
- niches and niching**
- (and from Ola Söderström - trajectories, bubbles, atmospheres)**

Data 2 - app



Data 3 – survey

Demographic and socioeconomic information:

Age, sex, education, work, *hukou*, income, housing, urban living, aspirations, family, stress, social support, neighbourhood, city life

Scales on: perceived stress, K6, SCL-10, social capital (work, neighbourhood), early life trauma, social support