



Disasters: Core Topics and Concepts of Psychological Research and Application

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Disasters

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Introduction

- This workshop represents a further step in a series of similar workshops dealing with psychological research and practice concerning disasters, and how people and communities deal with it and have effects for their biopsychosocial well-being. It is organized by the International Union of Psychological Science (IUPsyS) and its partners.
- IUPsyS represents over 1 million psychologists worldwide, organized by about 90 country members and 20 affiliated organizations.
- More information on past workshops, their program and results, see here:

[http://www.iupsys.net/events/capacity-building-workshops/
index.html](http://www.iupsys.net/events/capacity-building-workshops/index.html)



Introduction

- The guiding principle was to bring up-to-date basic and applied science of relevance to young investigators and academically trained practitioners, who are located in regions prone to (natural) disasters, such as the Asia-Pacific region.
- The target group is mostly people affiliated with, and trained in psychology as a discipline.
- The international faculty of the workshops always represented a mixture of various academic disciplines, mainly in psychology, that were more or less directly dealing with the topics. They are renowned experts in their fields.



Introduction

- We aimed at a combination of basic, applied, and translational research, ranging from new insights into pathways in the emergence of disaster consequences for human behavior and development, over cutting edge research in relevant contexts such as family and communities, to particular manifestations of strain such as bereavement and PTSD, and finally to various means of evidence-based interventions.
- A prime emphasis always was on the cultural awareness needed when generalizing scientific approaches, on roots of individual and collective differences in the response to disasters, such as personality and resilience, on long-term consequences utilizing longitudinal research, and finally the focus was on methodological rigor in planning interventions as a common denominator of all science.



Natural Hazards and Disasters

Definitions (following UNISDR, 2009)

- **Natural hazards:** potentially damaging physical events and phenomena, which may cost the loss of life or injury, property damage, social and economic disruption, or environmental degradation.
- **Disasters:** serious disruption of functioning of a community or society, causing wide spread human, material, economic or environmental loss.
- **Risk process:** disasters result from a process comprised of a combination of hazards, conditions of vulnerability, and insufficient capacity for measures to reduce the potential negative consequences of risk.



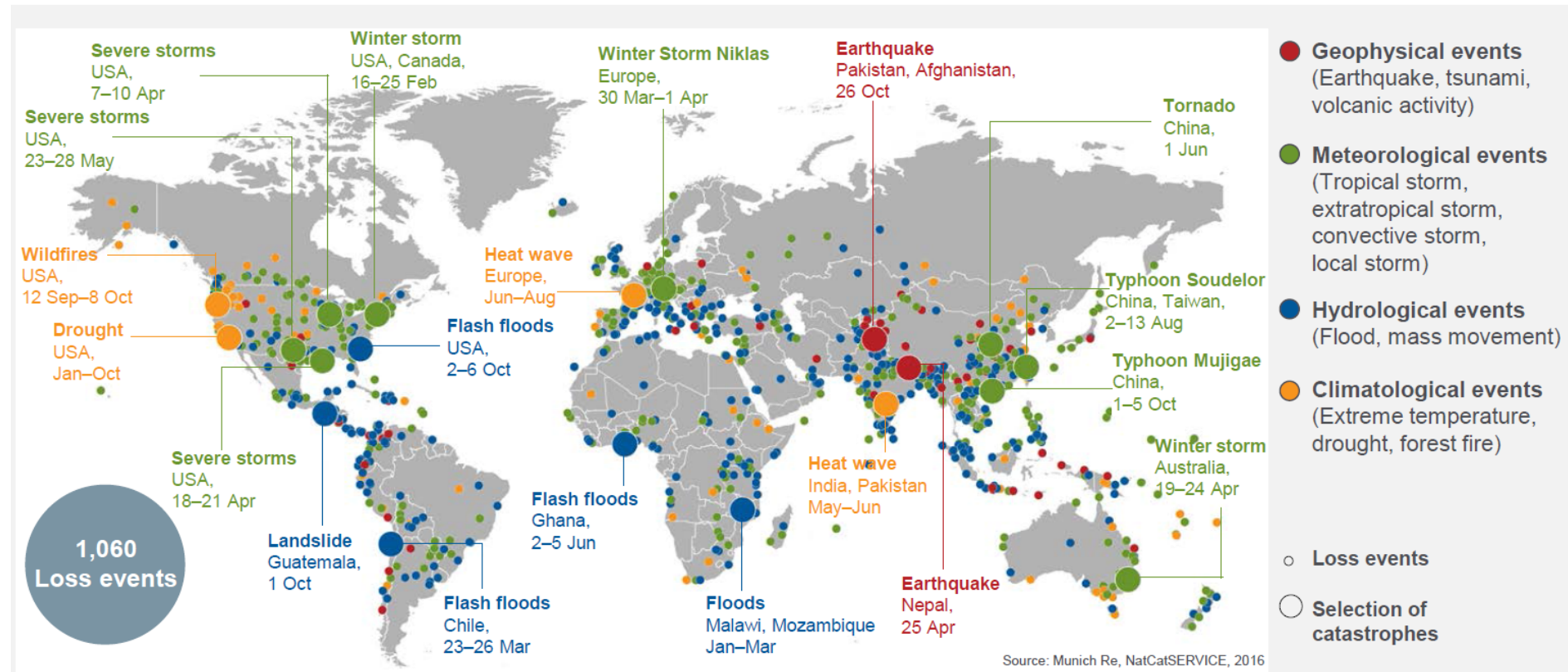
Natural Hazards and Disasters

- Typically 4 types of risks distinguished:
 - Geophysical events
 - Meteorological events
 - Hydrological events
 - Climatological events
- Disasters associated with natural hazards can be found around the globe:



Natural Hazards and Disasters

Natural loss events worldwide 2015 Geographical overview





Natural Hazards and Disasters

NatCatSERVICE

Munich RE 

Loss events worldwide 1980 – 2015

10 costliest events ordered by overall losses

Date	Event	Affected area	Overall losses in US\$ m original values	Insured losses in US\$ m original values	Fatalities
11.3.2011	Earthquake, tsunami	Japan: Aomori, Chiba, Fukushima, Ibaraki, Iwate, Miyagi, Tochigi, Tokyo, Yamagata	210,000	40,000	15,880
25-30.8.2005	Hurricane Katrina, storm surge	United States: LA, MS, AL, FL	125,000	60,500	1,720
17.1.1995	Earthquake	Japan: Hyogo, Kobe, Osaka, Kyoto	100,000	3,000	6,430
12.5.2008	Earthquake	China: Sichuan, Mianyang, Beichuan, Wenchuan, Shifang, Chengdu, Guangyuan, Ngawa, Ya'an	85,000	300	84,000
23-31.10.2012	Hurricane Sandy, storm surge	Bahamas, Cuba, Dominican Republic, Haiti, Jamaica, Puerto Rico, United States, Canada	68,500	29,500	210
17.1.1994	Earthquake	United States: Northridge, Los Angeles, San Fernando Valley, Ventura	44,000	15,300	61
1.8-15.11.2011	Floods, landslides	Thailand: Phichit, Nakhon Sawan, Phra Nakhon Si Ayutthaya, Phthumthani, Nonthaburi, Bangkok	43,000	16,000	813
6-14.9.2008	Hurricane Ike	United States, Cuba, Haiti, Dominican Republic, Turks and Caicos Islands, Bahamas	38,000	18,500	170
27.2.2010	Earthquake, tsunami	Chile: Concepción, Metropolitana, Rancagua, Talca, Temuco, Valparaíso	30,000	8,000	520
23./24./27.10.2004	Earthquake	Japan: Honshu, Niigata, Ojiya, Tokyo, Nagaoka, Yamakoshi	28,000	760	46

Source: Munich Re, NatCatSERVICE, 2016



Natural Hazards and Disasters

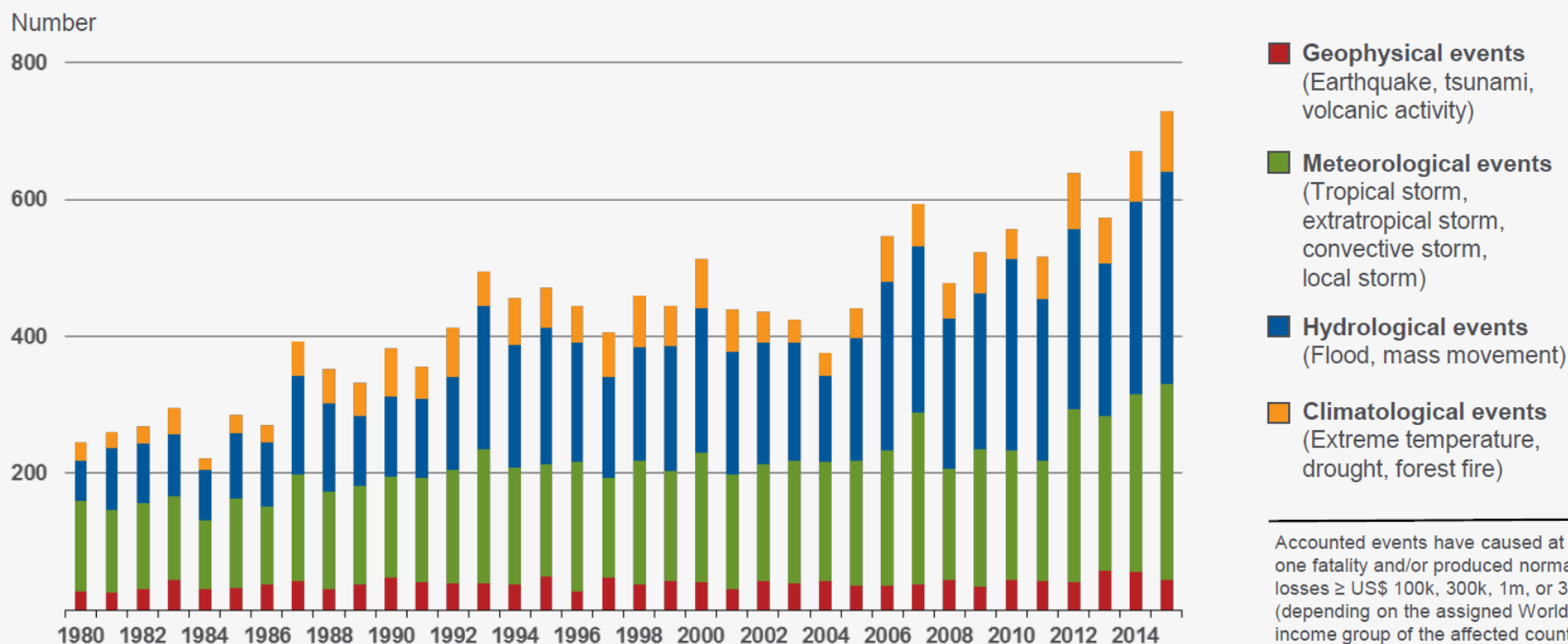
- Number of disasters overall have steadily increased over the last several decades, especially hydro-meteorological and climatological disasters.
 - These two disasters amount to 80% of the total, affect about 95% of populations hit by disasters, and count for 50% of death toll.



Natural Hazards and Disasters

Loss events worldwide 1980 – 2015

Number of relevant events by peril



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Natural Hazards and Disasters

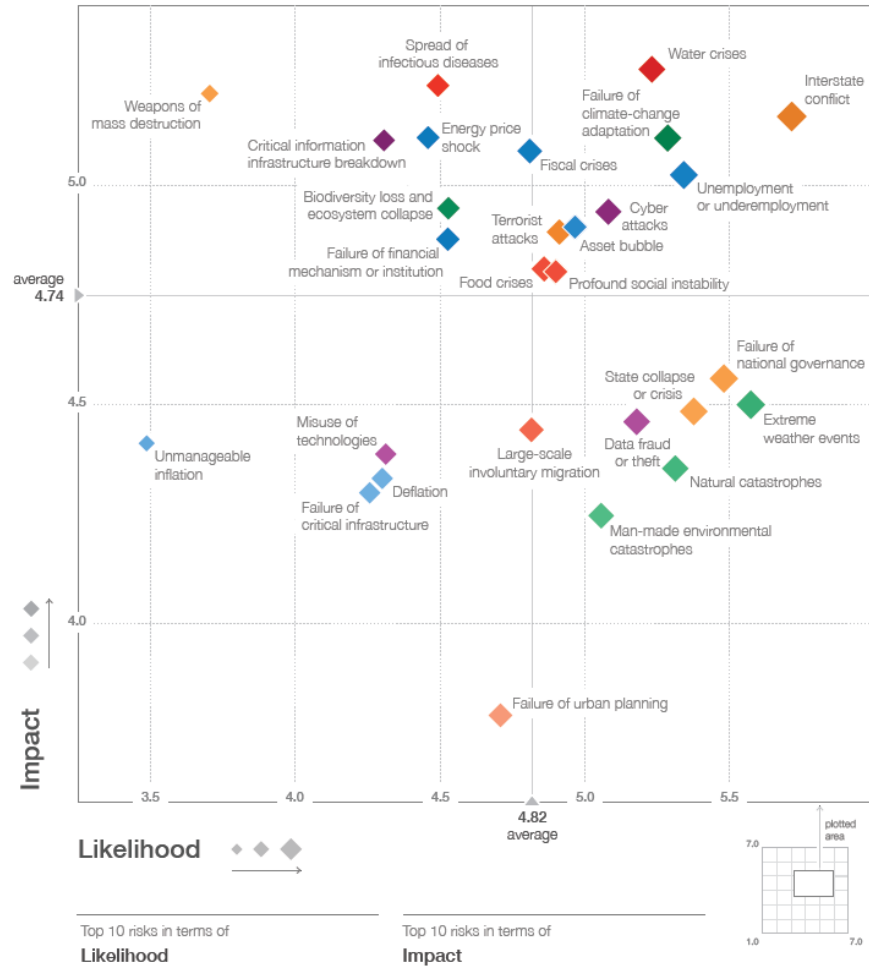
- Asia-Pacific is a special case (Cutter et al., 2015):
 - Region with more losses compared to other regions of the world. In 2013, 19 of 22 Million people displaced by floods, earthquakes, and typhoons lived in Asia-Pacific.
 - Out of 10 worst disasters during 21st century, 7 happened in Asia-Pacific.
 - Globally increasing extreme events will hit Asia-Pacific hard due to rapid population growth and urbanization (6 of 10 largest cities in the world located in Asia-Pacific)
 - Urban population in 2020 will be 55%, increased from 17% in 1950.



Natural Hazards and Disasters

Figure 1: The Global Risks Landscape 2015

- Global Risks 2015 (World Economic Forum): Survey with ca. 900 leaders.
- Likelihood of risks to occur within 10 years (1= very unlikely, 7 = very likely) by impact.
- Eg, failure of climate change adaptation highly likely and strong impact.



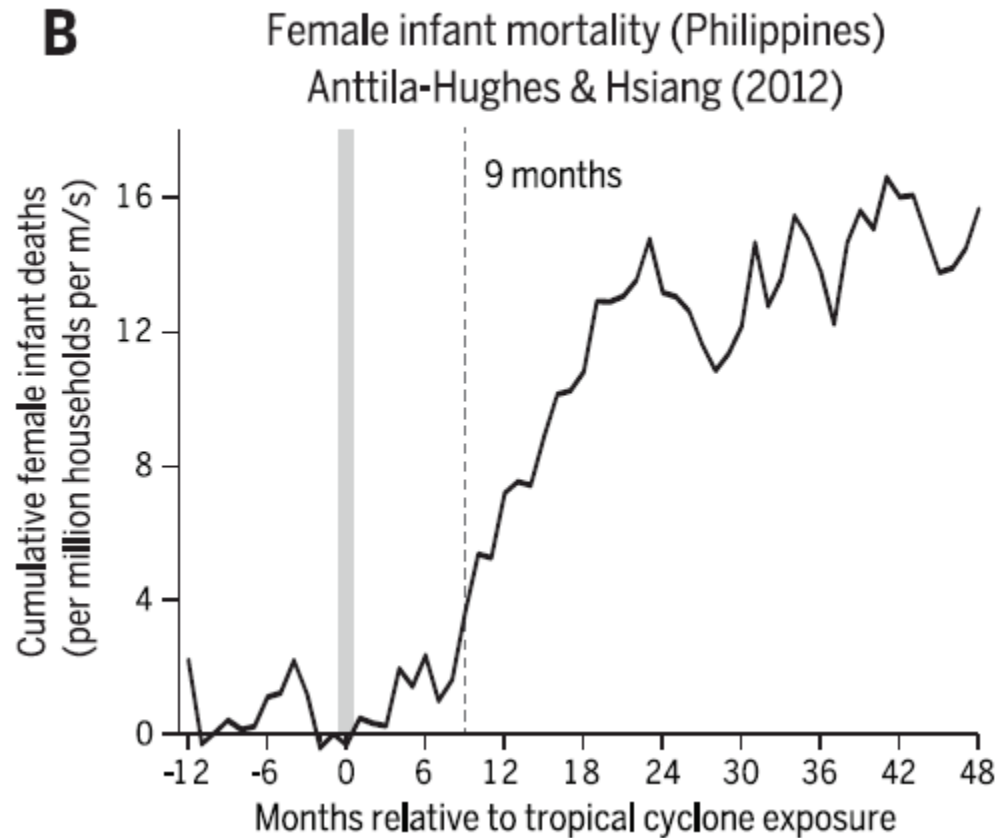


Natural Hazards and Disasters

- Psychological Science is interested in social and economic impacts.
- A recent review by Carlton et al. (2016) on climate showed the intricate pathways of effects concerning health, economy, social interactions, population structure and migration
- Eg, Attila-Hughes & Hsiang (2102) report dramatic consequences of tropical cyclones on infant mortality due to birth complications, and for those who survived such early life adversities have long-lasting negative effects by various mechanisms (epigenetic mechanisms affecting the stress system)



Natural Hazards and Disasters





Exposure and Vulnerability



Hazard

Risk

Exposure

Vulnerability

Resilience



Exposure and Vulnerability

- **Exposure:** location of people, assets, infrastructure in hazard-prone areas which could be affected.
- **Vulnerability:** degree of susceptibility or sensitivity of people, assets, and infrastructure to suffer damage.
- Exposure is key determinant of disaster risk, and vulnerability is key driver of disaster loss.
- Both show temporal and spatial variability, plus differentiation by race/ethnicity, social class, gender, age, etc.
- Exposure is exponentially increasing due to population growth and increase in economic assets.



Exposure and Vulnerability

- **Resilience:** capacity for overcoming adversities and dire circumstances. It is rooted in particular interaction between person and environment, not a habitual person attribute (Masten, 2014).
- Often people's resilience is underrated (Bonanno, 2004). Populations who have lived over generations in disaster-stricken regions have developed more resilience than expected. This is a case of the tandem between individual development and cultural change (Jensen, 2015).
- Adaptive individual conditions of resilience:
 - Attachment and close relationships
 - Learning and thinking (CNS related)
 - Self-regulation (CNS related)
 - Mastery motivation
 - Spirituality



Exposure and Vulnerability

- Resilience is one of several trajectories of stress response, following exposure to disasters, (Norris, Tracy & Galea, 2009), but probably not the modal one (Infurna & Luthar, 2016)

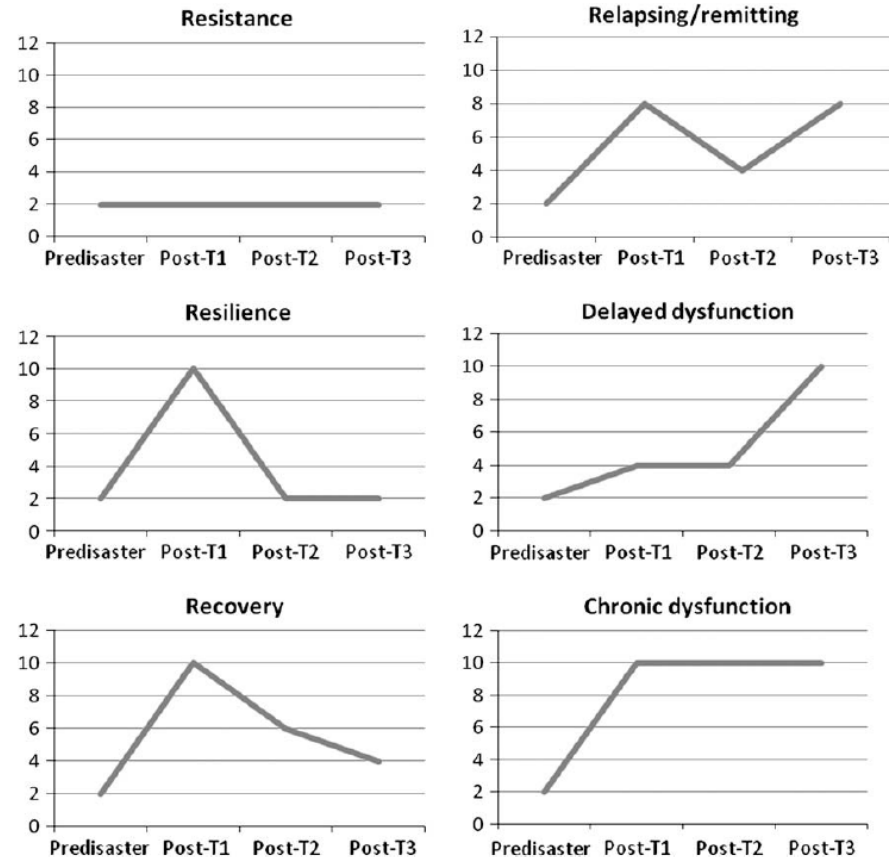


Fig. 1. Hypothesized trajectories of the course of stress responses.



Exposure and Vulnerability

- Postraumatic Growth (PTG) is the notion that disasters may have a positive influence on personality (Jayawickreme & Blackie, 2014). Recent research demonstrated, however, that experiences like better relation to others or appreciation of life are themselves likely to produce stress. Consequently, PTG may have a self-deceptive, illusionary side as well (Blix et al., 2016).

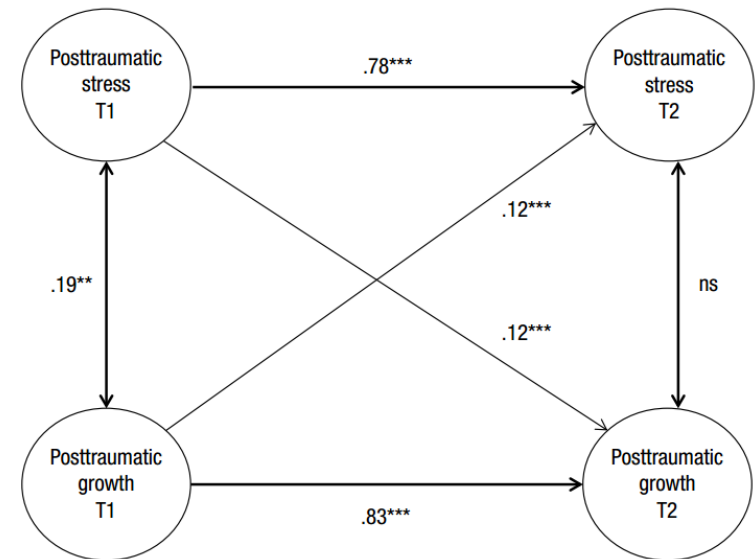


Fig. 1. Model of relationships between posttraumatic stress and posttraumatic growth at T1 and T2 with standardized estimates. *ns* = not significant. ** $p < .01$. *** $p < .001$.



Role of Psychological Science

- Assessment of disaster risk based on vulnerability and exposure is of fundamental importance for policy makers.
- Science and its translation into action is crucial for assessment of disaster risk:
 - An example of its role is the comparison of two earthquakes: 1 of every 10 Haitians died at the M7.0 Port-au-Prince earthquake, but only 1 of every 2500 Chileans at the M8.8 Concepcion earthquake, also 2010.
 - Difference due to better preparedness.



Role of Psychological Science

- Risk communication and risk reduction measures are crucial – people of Haiti were not aware of the seismic risks and had no appropriate building code, whereas this was the case in Chile (Zoback, 2014).
- Beyond the tremendous investments due to economic power and measures for reduction of poverty there are no-cost or low-cost interventions possible, such as collaboration between regional scientists in community alliances.
- Relevant and productive science needs to be evidence-based and must address causes:



Role of Psychological Science

- Study of evidence, theory-based, consistent positive results in real world.



THE CAMPBELL COLLABORATION

What helps? What harms? Based on what evidence?

[Evidence and Needs Assessment Survey: The Campbell ...](#)

It will identify priorities for the information needed following natural **disasters** and other humanitarian emergencies, which will help with the identification of ...

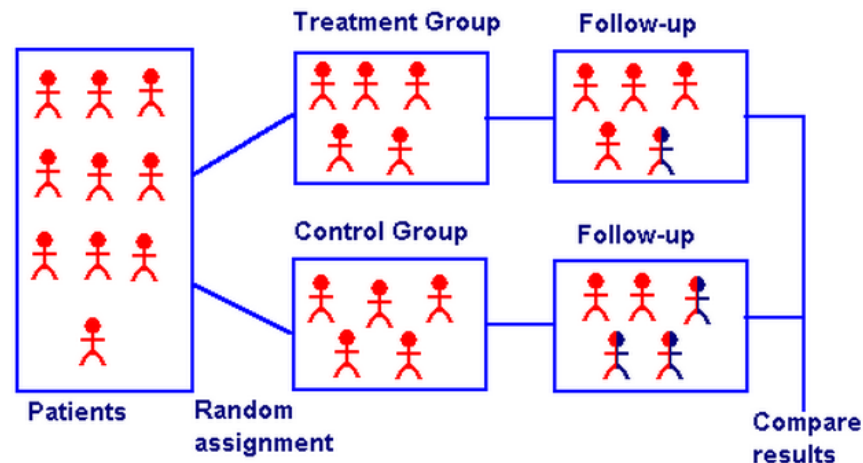
www.campbellcollaboration.org/.../Evidence_and_Needs_Assessment_Survey.php



Role of Psychological Science

- Using Randomized Control Trials (RCT) – there is a dramatic lack of such studies on the outcomes of risk communication (Bradley et al. 2014).

Randomized Controlled Studies





Role of Psychological Science

- Dealing with disasters in a psychological framework needs a heuristic approach that appreciates the interrelatedness of environmental risks and economic, social, and cultural systems, within which people behave and develop (Hyogo Framework, 2005).
- Psychological research and practice plays a part in the 4Rs (Ministry of Agriculture and Forestry New Zealand, 2005):
 - **Reduction:** examining sources of risks and implement mitigation measures.
 - **Readiness:** planning and training what to do.
 - **Response:** mobilization of necessary emergency measures.



Role of Psychological Science

- **Recovery:** restores functioning after immediate needs are satisfied
- All of the above can profit from psychology, but it must also be guided by cultural awareness about the constraints of existing psychological models.
- International response to 2004 Indian Tsunami was an example of mislead presumptions based on Western models and thinking (Christopher et al., 2014).
 - Presumed PTSD, depression and suicide at endemic proportions, other than local experts, and the latter were right.



Role of Psychological Science

- Brought Western-derived interventions that were inadequate for local ways of social interaction and norms concerning privacy, dignity, emotional display, and family solidarity.
- Disregarded local knowledge concerning how people and communities deal with suffering.
- Consequently psychology as a discipline needs to internationalize
 - Including knowledge gained by other disciplines interested in cultural issues.
 - This means more than multicultural sensitivity – it requires openness to learning from fellow psychologists in the regions.



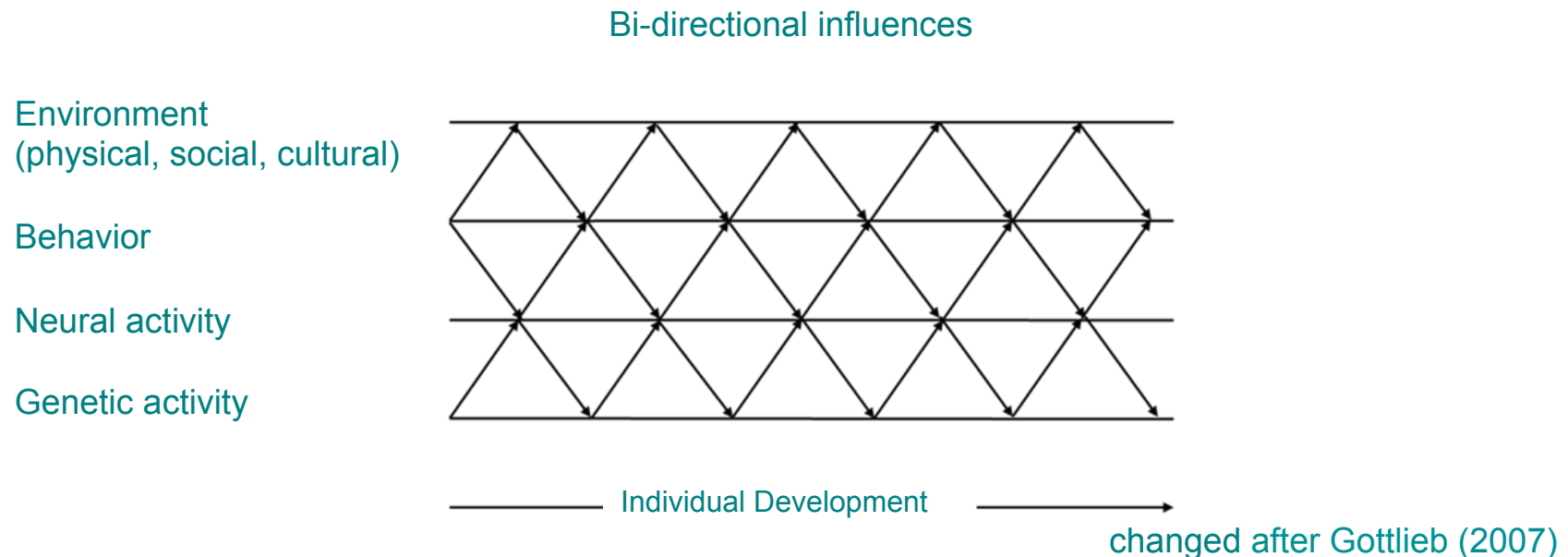
Hotspots of Relevant Psychological Research

- What follows is a short presentation of 2 new research lines that are likely to change the field of psychological research on disaster. It addresses in a new way the biological and the ecological background of human behavior and development, and its interplay – aspects underrated in traditional research.
- Both topics were addressed at all workshops of the series to various degrees, and because they are not the focal issue of this workshop's presentations, although they represent the backdrop, I want to introduce them here.



Hotspots of Relevant Psychological Research

- Human behavior and development is a dynamic system, working on different time scales, and comprising various bi-directional layers of functioning, with influences from the genetic to the environmental bottom-up, and in the reverse order top-down (Gottlieb, 2007).





Hotspots of Relevant Psychological Research

- Disasters represent a complex environmental influence inducing collective and individual responses in many ways – by physical change that disrupts connections and communications, by dislocation that disrupts communities and families, and by direct and indirect effects on biopsychosocial adjustment of individuals and groups.
- As illustrated by the Gottlieb Model, disasters themselves are affected by individual and collective activity.
- Psychological thinking about the pathways of influence in the interaction between individuals and environments has undergone tremendous change over the last few decades.



Hotspots of Relevant Psychological Research: Epigenetics

- Almost paradoxically the causal pathways linking environment to behavior and development are better understood than before due to new approaches in genetics.
- **Epigenetics:** a new strand of research on gene-environment interdependence, most relevant for response to disaster. Refers to modulation of gene expression on the molecular level through environmental stressors. Achieved by biochemical changes, such as DNA methylation, that alter the “readability” of DNA segments relevant for regulation of protein and enzyme products (Meaney, 2010; Silbereisen, van Ijzendoorn & Zhang, 2013).

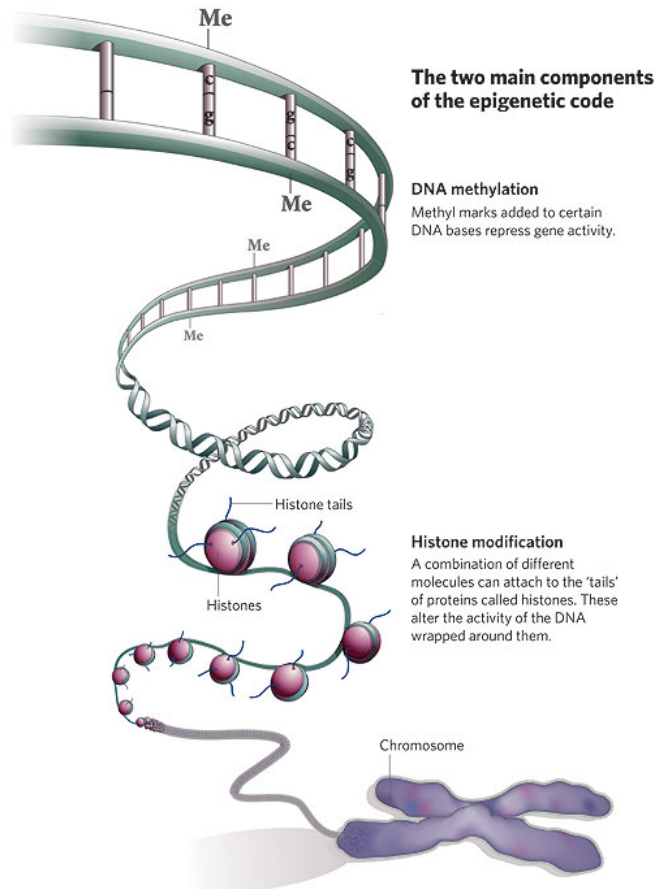


Hotspots of Relevant Psychological Research: Epigenetics

- Example of a sequential pathway, itself possibly moderated by the genome:
 - Adversities due to disaster experienced in own context.
 - Disruption of secure family relationship.
 - Decline of parenting quality.
 - Alters expression of genes involved in cortisol regulation in brain and body (FKBP5, role in immunoregulation), provokes differences in stress response, and is involved in depressive disorders and PTSD.



Hotspots of Relevant Psychological Research: Epigenetics





Hotspots of Relevant Psychological Research: Epigenetics

- Beyond that modification of genetic markers of DNA region relevant for HPA axis in general, with enduring biopsychosocial effects.
- Methylation can be revoked by lifestyle factors and psychological interventions.
- **Social Genomics:** Possibility of collective coordination of genome activity because individual regulation can be influenced by the experience with other people in social groups (Slavich & Cole, 2013).



Hotspots of Relevant Psychological Research: Social Ecology

- The physical, social, and cultural environment is the other end of Gottlieb's model. Past psychological research was often only interested in micro-level contexts, such as the family.
- This has changed with the advent of social ecology (Oishi & Graham, 2010) that puts real life contexts on various levels from macro to micro in the foreground.
- The question is whether and how human behavior and development are influenced by the social ecology and the culture, both of which are closely interrelated:



Hotspots of Relevant Psychological Research: Social Ecology

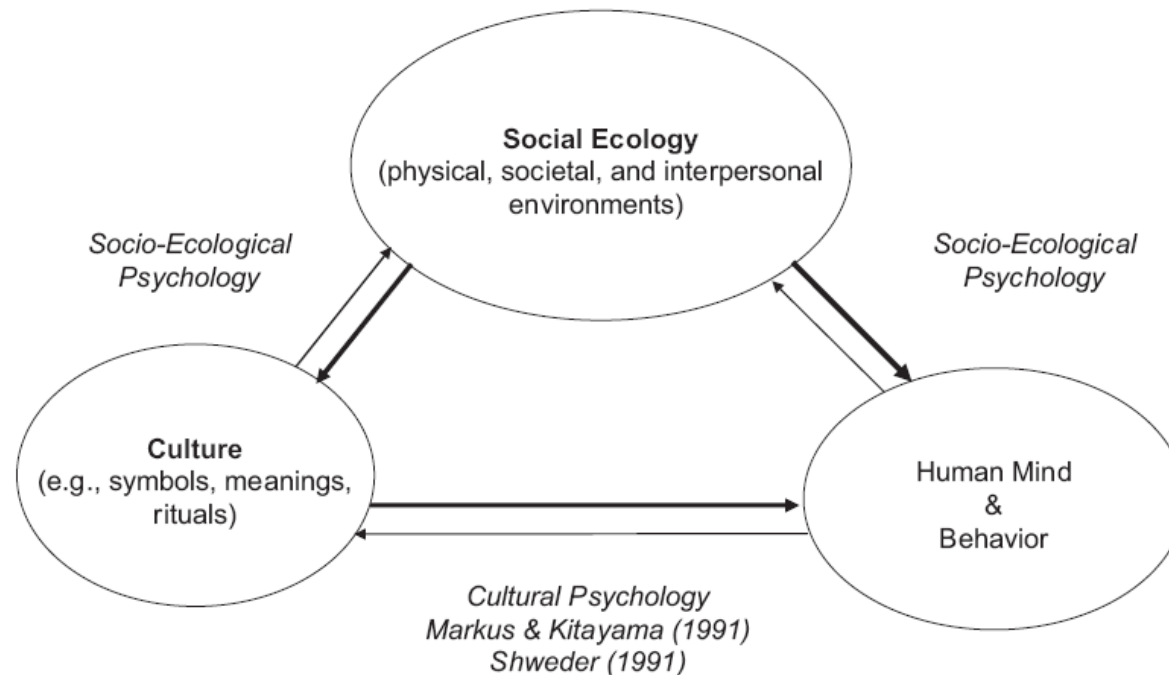


Fig. 1. Culture, social ecology, and psychology. In this figure, *culture* is defined as “explicit and implicit patterns of historically derived and selected ideas and their embodiment in institutions, practices, and artifacts” (Adams & Markus, 2004, p. 341).

Oishi, G. & Graham, J. (2010). Social Ecology: Lost and Found in Psychological Science. *Perspectives on Psychological Science*, 5, 356-377.



Hotspots of Relevant Psychological Research: Social Ecology

- Here are a few examples of the power of social ecology:
 - Research demonstrated that the historically high prevalence of pathogens in the environment influenced the modal personality. People living in such affected regions are more collectivist, family-oriented, less extravert, more religious, and in general more in-group-oriented, all of which can be interpreted as a way of protection against psychopathology (Fincher, Murray & Schaller, 2008).



Hotspots of Relevant Psychological Research: Social Ecology

- Economic research demonstrated the long arm of traditions. Young adults from adjacent regions of China differing in the main agricultural crop farmed, also differ in personality. Rice cultivation corresponds to a prominence of interdependent self and heuristic thinking, wheat to independent self and analytic thinking, reflecting differences in the efforts and cooperation needed for the labor intensive farming of rice (Thalhelm et al, 2014).



Hotspots of Relevant Psychological Research: Social Ecology





Hotspots of Relevant Psychological Research: Social Ecology

- Processes playing a role in the “translation” of culture and ecology into individual behavior were exemplified by Gelfand et al. (2011) by comparing 33 nations meant to represent cultural differences in tightness (many strong norms and low tolerance of deviant behavior) versus looseness (weak social norms and high tolerance of deviant behavior).
 - This cultural complex is rooted in historical ecological threats, prominent among them disasters like Tsunamis.



Hotspots of Relevant Psychological Research: Social Ecology

- Together with the influence of associated socio-political institutions differing in various control measures, tightness and looseness were afforded in historical times because they helped to gain control over the threats.
- Both are promoted in current times by recurrent episodes in daily life that in their structure and constraints reflect the cultural orientation (strong versus weak).
- Finally, psychological functioning concerning self-regulation and related socio-cognitive functions develop to adapt mind and behavior to the structure and constraints (Nisbett et al., 2001)



Hotspots of Relevant Psychological Research: Social Ecology

- All components of social ecology and culture are not static, but undergo dynamic social change. Recent research stimulated by the great political, social, and economic transformations of our times has established a few empirically supported principles (Silbereisen & Chen, 2010).
 - **Syntax of change:** from rapid transition over gradual transformation to post-transformation, thereby correcting for “overshooting.”
 - **Cascade effects:** macro change arrives at individuals through series of subsequent interrelated changes in distal and proximal context.



Hotspots of Relevant Psychological Research: Social Ecology

- **Threat to social capital:** break-up of institutions makes individual differences in human capital salient.
- **Growing uncertainty:** traditional developmental tasks become challenged and undergo change.
- **Revitalization:** old cultural informal institutions undergo renaissance in spite of quick adaptation to new formal rules.
- **Threat to well-being:** often decrease in life-satisfaction without full recovery over longer period of time.



Hotspots of Relevant Psychological Research: Social Ecology

- Social change offers an opportunity to study the intricate relationship between culture and social ecology:
 - Famous example is research that compared young people living in successor states of the former Soviet Union. It found differences in behavior, in spite of the common education and training before the transformation, that one could trace back to differences in old cultural and economic traditions dating back to times even before the foundation of the Soviet Union (Titma & Tuma, 2005).



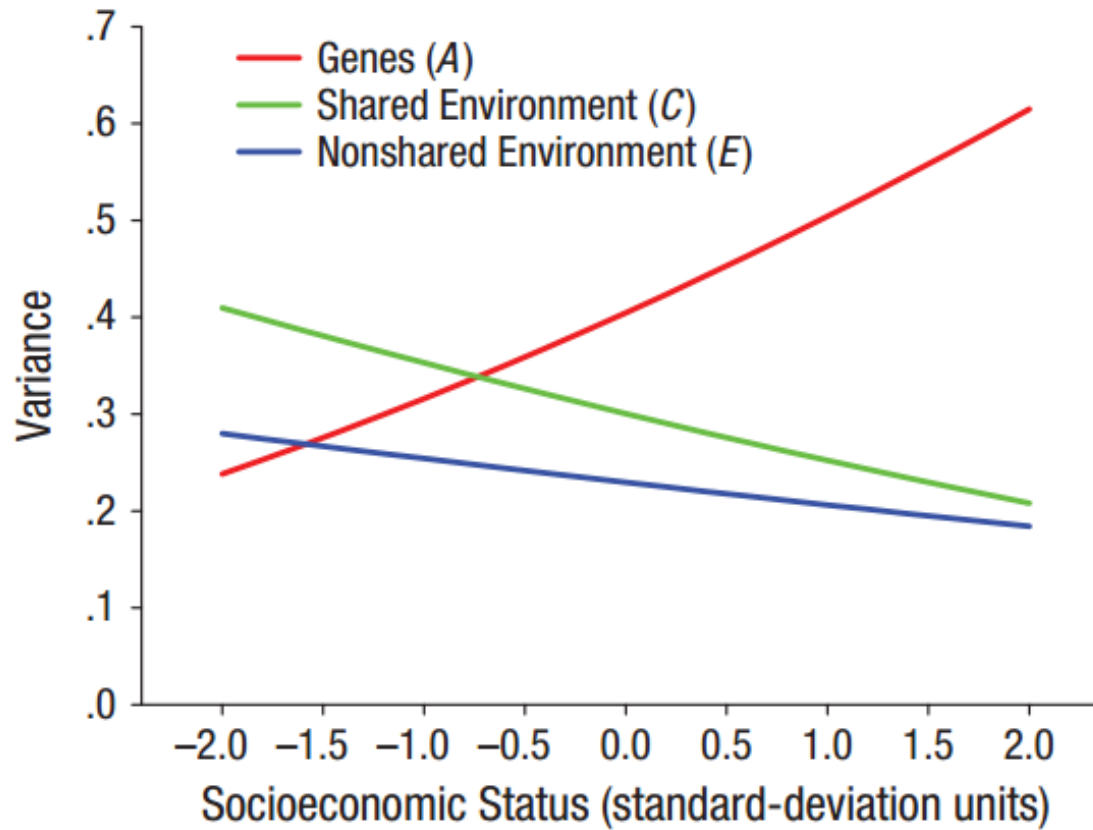
Hotspots of Relevant Psychological Research: Social Ecology

- The relevance of a perspective on social ecology for psychological research and practice concerning disasters is obvious: it has to take into account and appreciate the differences between cultures, regions, peoples, and life styles – the entire web of conditions impacts on human behavior and development.
- The foreseeable future of research will combine genetics/epigenetics and social ecology in new ways exemplified next:



Hotspots of Relevant Psychological Research: Social Ecology

- First, an example: it is well known (Tucker-Drob & Bates, 2015) that the genetic influence on intelligence is higher beyond the first decade of life in affluent environments, and in societies with less generous welfare systems.





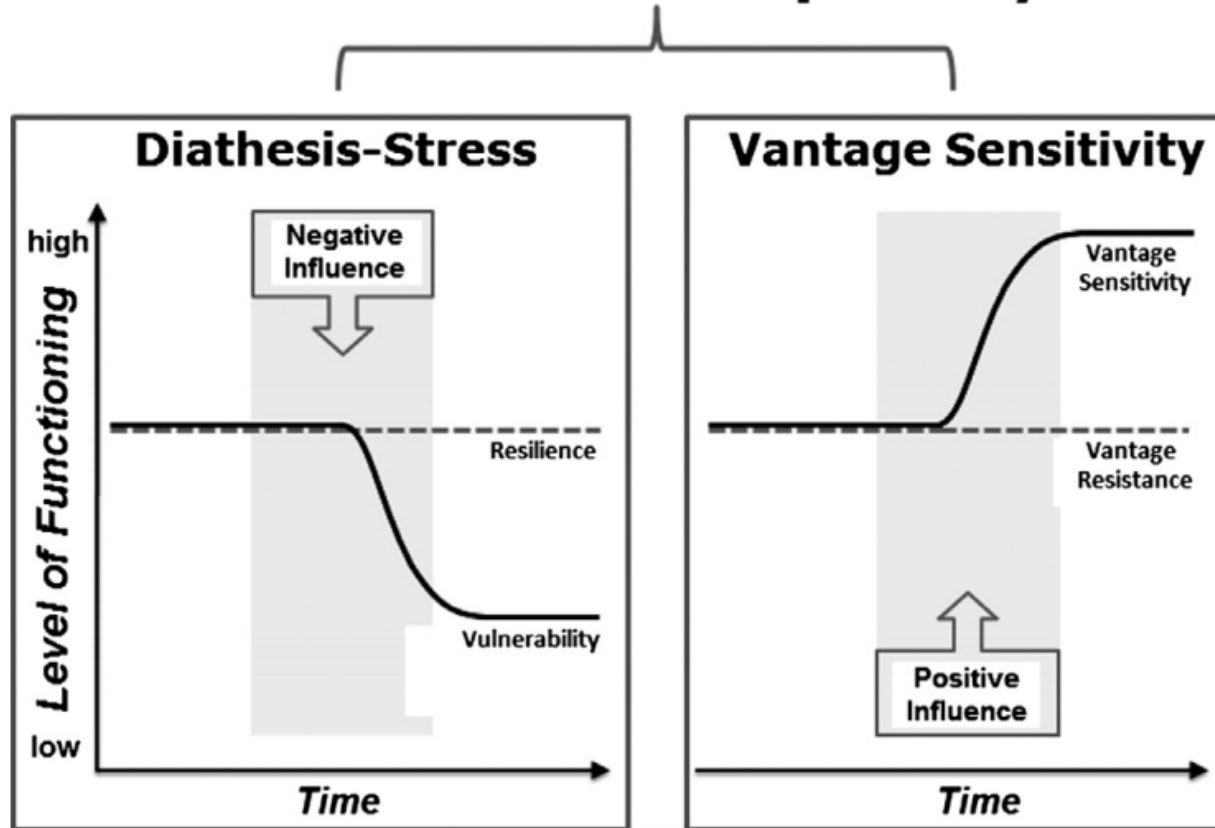
Hotspots of Relevant Psychological Research: Social Ecology

- Second, the notion of “differential susceptibility” (Belsky & Pluess, 2009) claims that some people are generally more affected by the social ecology than others, and this applies to bad or good environments alike. In devastating environments results are worse, in stimulating environments results are better than common among many. Markers of such differences are, among others, differences in neurobiological processes (MAO-A, 5-HTTLPR, DRD4) that themselves are affected by epigenetic processes which, in turn, are affected by broader environmental influences, such as disasters.



Hotspots of Relevant Psychological Research: Social Ecology

Differential Susceptibility





Hotspots of Relevant Psychological Research: Social Ecology

- Third, variation in genetic differences in “social sensitivity” proneness (eg, 5-HTTLPR) differs across cultures. Short alleles more prevalent in Asian populations, and related to collectivist orientation – a case of culture-gene coevolution (Chiao & Blizinsky, 2009). The characteristic social embedding of identity and support helps to reduce negative adjustment when confronted with traumatic events (Way & Lieberman, 2010).
- Observed correlation either due to cultural pressures on genetic selection, or due to pressures by genetic distribution on formation of culture.



Lessons for Science Communication

- Transfer of research insights to practice and policy makers. has often failed because (Spiel et al., 2011):
 - **Researchers:** scarcity of translational research (movement of research findings into the development of innovative interventions, practices, and policies).
 - **Practitioners:** motivation to recognize research findings moderate, poor knowledge about standards, criteria and methods. Need to increase readiness for intervention and establish teams and networks.
 - **Policy makers:** difficulties in taking up research results due to little familiarity. Requires advocacy for evidence and evaluation, cost-benefit analysis, promotion of public acceptance.



Lessons for Science Communication

- But there is hope (Cockcroft et al., 2012), and you can help!

SCIENCE COMMUNICATION

Legislators learning to interpret evidence for policy

Training for making health policy that has the best impact on a population

By Anne Cockcroft,¹ Mokgweetsi Masisi,²
Lehana Thabane,³ Neil Andersson^{4,5}

university degrees. Hoping to make parliamentary debates more grounded in evidence,





Lessons for Science Communication

- Research with relevance to practitioners and policy makers requires (Shonkoff & Bales, 2011; Shonkoff, 2000; OECD, 2015):
 - Mission-driven instead of curiosity-driven approach.
 - Excellent knowledge in relevant fields concerning theory, method, empirical insights, limitations.
 - Awareness that policy is under the influence of pressure groups, has a particular habit, and is watched by media.
 - Crisis situations are especially challenging because many feel encouraged to give advice, including “unorthodox” views propagated by media.



Lessons for Science Communication

- Policy is a bureaucratic culture of its own – what works, at what costs, with which outcome, for whom?
- Researchers have to align their evidence to factors mentioned above, and raise their voice.
- Never forget that “politics drive human functioning, dignity, and quality of life.” This is especially true in societies and situations with extreme power imbalances (Barber et al., 2014).
- Here is a check-list for science-advice (OECD, 2015):



Lessons for Science Communication

Box 4. A check-list for science advice

An effective and trustworthy science advisory process needs to:

1. **Have a clear remit, with defined roles and responsibilities for its various actors.** *This includes having:*
 - a. *a clear definition and, insofar as is possible, a clear demarcation of advisory versus decision-making functions and roles*
 - b. *defined roles and responsibilities and the necessary expertise for communication*
 - c. *an ex-ante definition of the legal role and potential liability for all individuals and institutions that are involved*
 - d. *the necessary institutional, logistical and personnel support relative to its remit.*
2. **Involve the relevant actors** – *scientists, policy-makers and other stakeholders, as necessary. This includes:*
 - a. *engaging all the necessary scientific expertise across disciplines to address the issue at hand*
 - b. *giving explicit consideration to whether and how to engage non-scientific experts and/or civil society stakeholders in framing and/or generating the advice*
 - c. *using a transparent process for participation and following strict procedures for declaring, verifying and dealing with conflicts of interest*
 - d. *having, as necessary, effective procedures for timely exchange of information and co-ordination with different national and international counterparts.*
3. **Produce advice that is sound, unbiased and legitimate.** *Such advice should:*
 - a. *be based on the best available scientific evidence*
 - b. *explicitly assess and communicate scientific uncertainties*
 - c. *be preserved from political (and other vested-interest group) interference*
 - d. *be generated and used in a transparent and accountable manner.*



Outline Workshop Activities



- Presentations by Faculty

- Plenum Discussion





Outline Workshop Activities



- Break-out Groups

- Poster Discussion





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