Mental Health in challenging times – A challenge for Complexity Science

Symposium of the European Academy of Sciences and Arts - Hybrid Conference
Thursday, June, 30th, 13h-18h
Mediensaal im Innenhof St. Peter (Eingang Pforte), Salzburg, Austria

The Corona pandemic concerns many different issues and has a wide spectrum of consequences during and after the pandemic but also influencing factors and "modulators". One is mental health which is concerned in many contexts and circumstances, all over the life span of most people. In consequence, the side and long-term effects of the pandemic and of all the measures against it (e.g., social distancing, closing schools, distance learning, lockdown of branches of the economy) have to be evaluated for mental health developments of people from young children to people well advanced in years, including families and social networks. What we need is a scientific based evaluation of the pandemic, the measures and the diversity of effects. From a complexity science perspective, it is a multifactorial network with many (nonlinear) feedback loops which has to be developed with support of experts from many disciplines. One of many mechanisms is the impact of stress, anxiety and depressed mood for all neuro-immunological processes of infection and etio-pathogenesis, including immunological and psychological resistance and salutogenesis. Likewise another societal challenge, war in Europe, may have a profound impact on mental health with many nonlinear feedback loops.

Like climate models we should develop complex bio-psycho-social models of all concerned processes of the self-organization of (mental) health all over the world. This is not only about epidemiology but about all important factors of health: education, economics, nutrition, health-related behavior, work, social networking and social relationships, sports and leisure activities, availability of moving in nature, public opinion and policy, medical measures and its results, trust in the measures, but also existing health impairments and any kind of disorders, mood states, anxieties, and so on.

A closer look at this will reveal that most scientific topics have to be included. This conference is intended as a first step to develop a broader understanding of this very complex system, without a need to act under urgency for decisions. The conference and the following steps could substantially contribute to the reliability and authenticity of science. Beyond this we will increase the public trust in science if we concede the complexity and multi-perspectivity of the societal challenges-related system, leading to efforts in developing a world-wide (mental) health simulation model.

Lectures

Introduction to "Mental Health in challenging times – A challenge for Complexity Science"

Klaus Mainzer

Emeritus of excellence of the Technical University Munich, Germany

President of the European Academy of Sciences and Arts

A (wo)man is not alone on an island: embracing the complexity of mental health in challenging times

Claudi Bockting

Prof. Claudi Bockting: professor of clinical psychology in psychiatry, Amsterdam University medical Centres, University of Amsterdam, a founding director of the Centre for Urban Mental Health and president of the EACLIPT, and previous fellow at the Institute of Advanced Study in Amsterdam and the World Health Organisation.

Common mental health disorders (depressive-, and anxiety disorders) are a worldwide epidemic and there is no evidence that the epidemic is subsiding. The COVID-19 pandemic further increased the prevalence worldwide with estimated adverse lifelong effects (Lokman & Bockting, in press). Other pandemics or societal crises such as war will amplify the adverse effects on mental health. Depression is a major contributor to the overall global burden of disease (WHO, 2019). Evidence for leading theories that explain the onset and maintenance of depression is fragmented, mostly focusing on a single etiological factor. Whereas, mental health conditions are the result of the interplay of mental-, biological, stress related- and societal factors that can change over time (Holmes et al., 2018). From a complexity science

perspective, it is a multifactorial network with many (nonlinear) feedback loops which has to be developed with support of experts from many disciplines. In this presentation first steps towards an integrative dynamical framework will be discussed that do incorporate the interplay between relevant factors that contribute to mental health conditions in order to explore new targets for prevention and treatment. Assuming that mental health is a complex system, doesn't necessarily mean that preventative interventions and treatments have to be complex as well. Examples will be given of simple interventions that have sustainable effects in treatment of depression and for relapse prevention (Breedvelt et al., 2021, Arjadi et al., 2018, Bockting et al., 2018). Implications for the model will be discussed.

Finally, you will be invited to contribute to an integrative dynamical theoretical as well as simulation model of mental health, in order to find new target points for interventions.

References

Arjadi, R., Nauta, M. H., Scholte, W. F., Hollon, S. D., Chowdhary, N., Suryani, A. O., Uiterwaal, C.S.P.M., Bockting, C. L. H. (2018). Internet-based behavioural activation with lay counsellor support versus online minimal psychoeducation without support for treatment of depression: A randomised controlled trial in Indonesia. Lancet Psychiatry, 5(9), 707-716. doi:10.1016/s2215-0366(18)30223-2

Bockting, C. L. H., Klein, N. S., Elgersma, H. J., van Rijsbergen, G. D., Slofstra, C., Ormel, J., . . . Burger, H. (2018). Effectiveness of preventive cognitive therapy while tapering antidepressants versus maintenance antidepressant treatment versus their combination in prevention of depressive relapse or recurrence (DRD study): A three-group, multicentre, randomised controlled trial. Lancet Psychiatry, 5(5), 401-410. doi:10.1016/s2215-0366(18)30100-7

Breedvelt J. J. F., Warren F. C., Segal Z., Kuyken W., Bockting C. L. H. (2021). Continuation of Antidepressants vs Sequential Psychological Interventions to Prevent Relapse in Depression: An Individual Patient Data Meta-Analysis. JAMA Psychiatry, 1;78(8): 868-875. doi:10.1001/jamapsychiatry.2021.0823

Bockting et al. (2018). Whom should we treat, for what, and with what? Embracing the complexity of mental disorders from personalised models to universal approaches. In: Holmes, E.A., Ghaderi, A., Hamer, C.J., Ramchandani, P.G., Cuijpers, C., Morrison, A.P., Roiser, J., P., Bockting, C.L.H., OÇonnor, R., Shafran, R., Moulds, M.L., Craske, M. The Lancet Psychiatry Commission on psychological treatments research in tomorrow's science. Part 8: Lancet Psychiatry, 5(3), 237-286. doi:10.1016/S2215-0366(17)30513-8.

Lokman, C. & Bockting C.L. Pathways to depressive and anxiety disorders during and following the COVID-19 pandemic. Lancet Psychiatry, in press.

World Health Organization. Depression. 2019 December 4 [cited 2020 January 21]; Available from: http://www.who.int/news-room/fact-sheets/detail/depression

Complexity dynamics in mental health – from personalized psychotherapy to general models and back

Günter Schiepek

Prof. Dr. Director of the Institute Synergetics and Psychotherapy Research at the Paracelsus Medical University Salzburg (Austria). Professor at the Department of Psychology, Ludwig-Maximilians-University Munich. Visiting professor at the Sapienza University, Rome (2019). Member of the European Academy of Sciences and Arts (since 2009).

Current challenges and global destabilizing processes like COVID, wars, economic crises, political displacements of forces and spheres of influence, climate change, and others might have unpredictable consequences for mental health. New types of generalized anxiety, depression, and stress-related disorders might emerge, but also bio-psycho-social resilience will get new qualities – may it be by new mechanisms of (re-)stabilization or by pattern transitions to new mental and social equilibria. For individuals and social micro-systems, the dynamics of boundary conditions are accelerating and threatening at the same time.

Complexity science in mental health allows to assess and model the dynamics of human change process, may it be in terms of pathology (rigidity and lacking flexibility) or in terms of development and adaptability – which may be a general dimension of human health vs. pathology. In psychotherapy, the change dynamics of patients can be assessed by high-frequency real-time monitoring which is technically realized by the Synergetic Navigation System (SNS). It integrates app-based data collection and nonlinear time series analysis in order to get an in-time feedback of the change dynamics of each patient, which can be used for a continuous cooperative process control. Meanwhile, SNS-based psychotherapy is routine practice and by this creates big data sets of mental health care dynamics and outcome. The analysis of big data sets reveals insight into personalized as well as into general mechanisms of change, like self-organized pattern transitions, critical instabilities, de- and re-synchronization of mental processes, and others. Recovery from disorders may require destabilization from the inside more than from the outside of systems. Severe destabilization from the outside may impede destabilization and cascades of order transitions, which may increase rigidity of systems at any level and scale.

This way of real-time monitoring integrates qualitative and qualitative approaches, science and practice, but also a personalized (idiographic) and a generalized (nomothetic) approach. Assessment and modeling is based on case formulations which is done in cooperation with each patient. At the level of data aggregation, hypotheses on change dynamics can be tested with reference to general theories like self-organization and chaos theory, which – the other way round – suggests to focus on the personal systems of the patients. Computer simulations can be used to get deeper insight into therapeutic processes and by specifying parameters, initial conditions and input (interventions) also can predict short-term effects of interventions before applying them to real patients. Digitalization, applied algorithms and AI may change practice and research.

Beyond individualized and change-type models (e.g., theories of psychotherapy) visions could go to "climate models of mental health". Will it be possible to develop complex bio-psycho-social models of all concerned processes of the self-organization of (mental) health all over the world? This is not only about epidemiology but about all important factors of health: education, economics, nutrition, health-related behavior, work, social networking and social relationships, sports and leisure activities, availability of moving in nature, public opinion and policy, medical measures and its results, trust in the measures, but also existing health impairments and any kind of disorders, mood states, anxieties, and so on. For going this way, an international cooperation in complexity of mental health would be necessary.

Resilience in action trough social mental health challenges

Franco Orsucci

Professor at the University College London, UK and Head of the Mind Force Society, Institute for Complexity Studies, Rome, Italy

The recent Covid, war, and financial challenges are impacting societal optimal complexity, harmony and cascading on general mental health. Many complex systems can be seen as networks of subsystems. The bouncing back from challenges implies a capacity to avoid a cascading collapse that brings the entire network down. It has been shown that in networks in which the elements depend on each other (facilitative networks), a rising correlation between

the fluctuation in the time series of different elements may indicate the risk of such a systemic collapse. Interactive dynamics of subsystems (e.g., mood, physical health, cognition, social support) are predicted to become more correlated in a network with low systemic resilience. The emergence of DIORs (dynamical indicators of resilience) clarifies how systemic capacity, robustness and resilience rely on heterogeneous networks where correlation is in place, but within a wider range of resonance capabilities.

An integrative computational model of psychopathology. The Harmonium Model

Sergio Salvatore

Sergio Salvatore, Ph D. Professor of Dynamic Psychology at the Department of Dynamic and Clinical Psychology, and Health Studies, La Sapienza University of Rome. Chief editor of Culture in Policy Making: The Symbolic Universes of Social Action (Springer Book Series). Chief Editor of Yearbook of Idiographic Science (IAP Book Series). Editor of Rivista di Psicologia Clinica. Associate editor of Integrative Psychological and Behavioral Science.

In last years, the thesis that the different forms of mental disorders are fostered by a general psychopathology factor - the p factor hypothesis - has gained momentum. It will be presented a semiotic, embodied, and psychoanalytic model of the p factor, the Harmonium Model (HM). HM grounded on the view of the mental processes involved in psychopathology to poorly-modulable cognitive dynamics. The HM provides a computational account of such a rigidity, modelling it in terms of dimensionality of the Phase Space of Meaning (PSM). Two studies provided a first validation of the HM. They were based on a simulation design implementing a deep learning model, simulating a cognitive process (a classification task). The dimensionality of the neural network's inner computational dynamics was considered the simulated equivalent of the PSM's dimensionality. Theoretical and methodological implications of studies will be discussed.

Mapping the interaction between online social networks and the behavioral, emotional, and cognitive risk factors for mental health conditions of millions of individuals during a pandemic

Johan Bollen

Prof. Johan Bollen (USA): Professor of informatics and cognitive science at Indiana University, a founding director of the Center for Social and Biomedical Complexity, and fellow at the Center for Urban Mental Health at the University of Amsterdam and the Synergy Program for Analysing Resilience and Critical transitionS (SparcS) at Wageningen University (NL).

Advances in machine learning and natural language processing now allow us to track the behavioral, cognitive, and emotional states of millions of individuals from the traces they leave behind on social media. These data-driven, computational approaches generate high-resolution, longitudinal, within-subject data that can inform studies of the complex and variegated dynamics of mental health risk factors. This has become particularly useful during a historical COVID-19 pandemic marked by unprecedented public health mitigation measures, e.g. lockdowns, social distancing, and restrictions on socializing, that are likely to have profound contemporaneous effects on mental health. In my talk I will discuss some of our recent results from analyzing the possible effects of the COVID-19 pandemic on individual and public mental health risk factors, including changes in mood and online activity patterns. These results stem from our efforts to study the interaction between mental health and structural changes in online language, social network structure, and activity levels for individuals with internalizing disorders. This also includes the effects of social network context on individual well-being and mental health, in particular how the structural features of online social networks can distort the perception of others, implying a possible pathway for how social media use (during a pandemic) can be deleterious to well-being and mental health.

Open forum for interactions: towards an integrative dynamic model of mental health

Claudi Bockting, Can Lokman, Klaus Mainzer, Günter Schiepek, Helmut Schöller, Franco Orsucci