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WORKING PAPER

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**Working Paper No. 002
June 2009**



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Resilience and Positive Disintegration in Mental Health Systems*

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***DRAFT for DISCUSSION – Please do not quote without authors' permission**

Abstract

The dominant pharmacological approach traces abnormalities observed at any level back to the smallest level of organization where they can be found, and treats them at that level, typically by modifying neurobiological structures. In this paper, we draw on Kazimierz Dabrowski's theory of positive disintegration to suggest an approach to mental health that includes a positive role for discontinuity and variability in the development of the individual. This approach may offer an alternative to the simple suppression of symptoms. Dabrowski's approach suggests interesting avenues for investigation into the role of growth and development within a human life cycle and the role of agency within nested complex systems. Moreover, understanding the mind and its cycles of breakdown and reorganization is central to understanding human social systems and their interaction with ecosystems.

Key words: mental illness, allostasis, resilience, positive disintegration, breakdown reorganization, social systems, mental health

Resilience and Positive Disintegration in Mental Health Systems

The interpretive framework used to understand mental illness shapes both our understanding of its causes and symptoms and our selection of interventions. Archeological evidence suggests that the earliest human societies saw what we call mental illness as an effect of spirits, and treated it using techniques ranging from exorcism to drilling holes in the afflicted person's head. Early in the 20th century, mental illness was thought to arise from repressed events in childhood. Psychotherapy sought to cure the patient by uncovering those events (Porter, 2002).

In the last 50 years, increases in the effectiveness of pharmacological drugs have dramatically increased the manageability of symptoms and a psychopharmacological approach has come to dominate. This approach is nested within a more general tendency toward the medicalization of the mind that has dominated Western culture since the early twentieth century. It involves regularizing chemical functioning through modification of the lowest level of organization where irregularities are observed.

While effective at controlling symptoms in the short run, the psychopharmacological approach rests on a number of assumptions that the resilience approach calls into question. Namely that:

1. If the individual and the society are in conflict, the individual should change;
2. System breakdown can be explained and treated at the lowest level of organization where problems are observed; and
3. Stability is the same as resilience so irregularity is a problem and chemicals should be "in balance."

If these assumptions were true, it would be natural to expect that we could modify low-level structures to remove breakdown, disorder, and irregularities, but this goal in itself may be problematic. It is seriously misleading to assume that once we understand the mechanics of specific subsystems, the complexities that arise from social, non-linear, and historically contingent

elements will move to the background and we will be able to normalize people using standardized diagnosis and treatment methodologies.

This paper argues that the psychopharmacological approach is a simple approach to a complex problem and that resilience suggests the limitation of the model. We then suggest that an approach rooted in resilience studies, and drawing on Kazimierz Dabrowski's theory of positive disintegration (TPD), can enrich the reductionist pharmacological approach and its prominent alternative the biopsychosocial (BPS) approach to understanding mental health systems.

An approach rooted in resilience raises different questions about the mind and its modes of failure and creation. In particular, it offers a way to understand the role of discontinuity, novelty, and cross-scale interactions. Looking at the mind can also help to clarify the relationship between social and ecological systems.

Interpretive Frameworks for Understanding Mental Illness

The pharmacological approach represents a particular cluster of associations across the several levels of the mental health system. Figure 1 depicts linkages in the pharmacological model. It illustrates how symptoms presenting in the phenomenal level at the bottom are connected to therapeutic interventions at the institutional level through a conceptual frame or paradigm (the yellow layer). This conceptual frame determines both how behaviours are interpreted and which institutional responses are adopted.

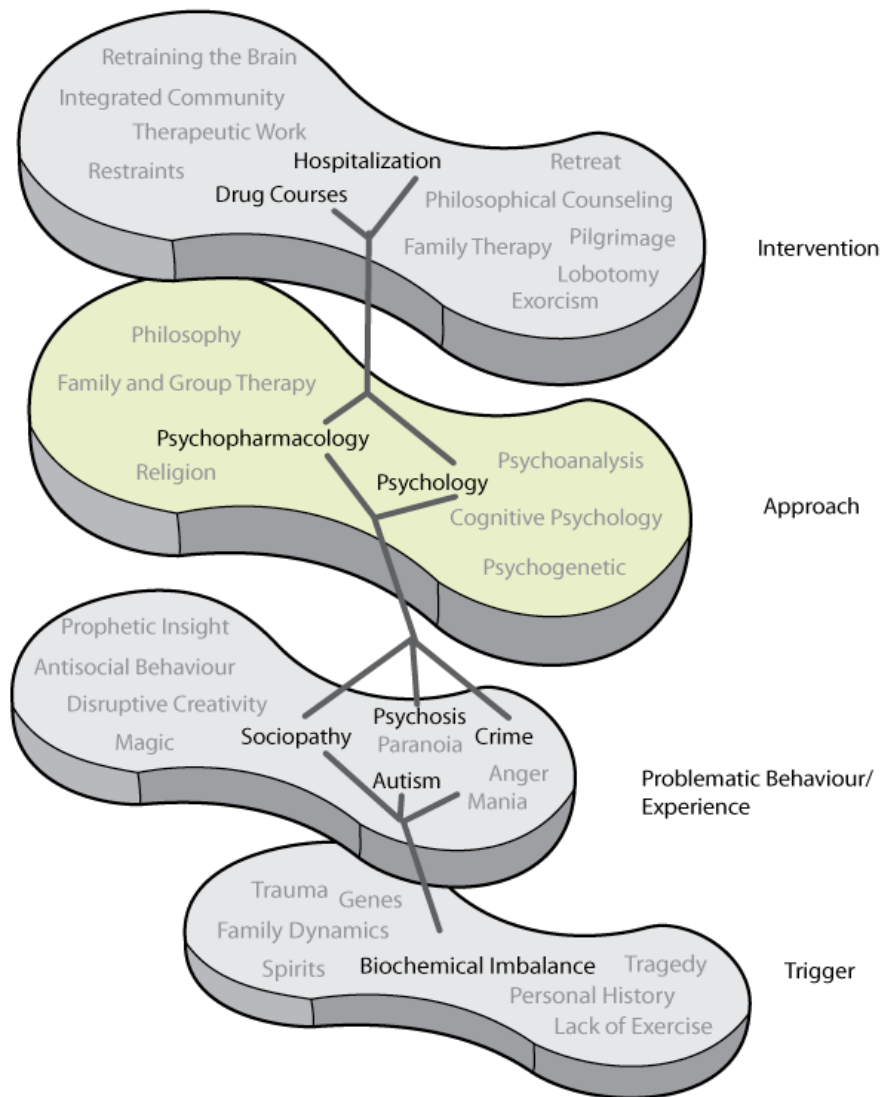


Figure 1: The dominant approach to understanding mental illness shapes both interpretation and intervention.

Although epidemiological evidence indicates that conditions like schizophrenia and depression appear across cultures, how they are understood and treated differs remarkably. Typically, in the contemporary Western system a problematic behaviour or experience is identified with a biochemical imbalance and either drugs are used to control the symptoms or the individual is removed to a treatment facility.

One striking example of an alternative interpretive framework was identified in a study conducted with communities in post-conflict Eritrea following the border war with Ethiopia. When researchers inquired about possible psychological trauma, they were surprised to find that the internally displaced wanted to tell their own stories of resilience instead. Despite emotional distress caused by the war and subsequent loss of their homes, the Eritrean women in particular did not consider themselves depressed or traumatized. In fact, there is no word for depression in their language; the closest approximations in Tigrinya were *Chinquet* (mental oppression), *Hasab* (thinking too much), and *Ihihta* (sighing), originating from social rather than biological causes (Almedom et al., 2003; Almedom, 2004). A similar phenomenon was reported earlier in Ethiopia where women described "*Yemenfes Chinquet*" in Amharic, which translates as "Oppression of the Soul," a state of being demoralized (Almedom, 1995).

Understanding the problem as "Oppression of the Soul" calls for different responses as appropriate. If you are "depressed," you have a medical problem and you seek biomedical balance. If you have "Oppression of the Soul," you work hard to tell your story; the solution is to restore your sense of coherence. Interpretations, in short, have an impact across scales, from the individual experience to the broader institutional structures, including resource and authority flows, and the nature of the "standard" response.

Tracing the history of sciences of the mind from the early approaches of ancient Greek philosophy through the developments of the renaissance and the enlightenment as well as the more recent study of psychoanalysis, systems theories, and neuroscience psychologist, Theodore Millon argues that distinct stories developed over time, and while different approaches have dominated at different times, they have neither succeeded in replacing one another nor been synthesized. He suggests that these stories continue as co-existing paradigms and that there is a need for synthesis (Millon, 2004).

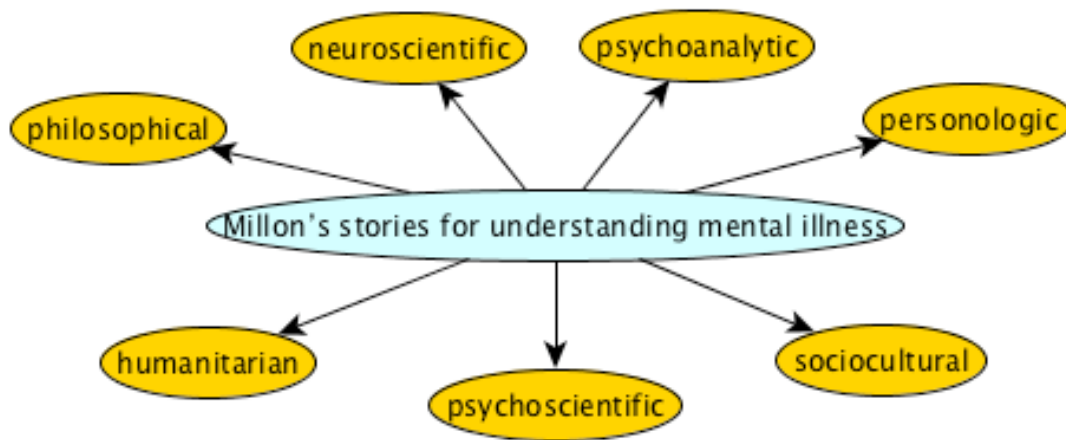


Figure 2: Millon's stories for understanding mental illness: philosophical, humanitarian, neuroscientific, psychoanalytic, psychoscientific, sociocultural, and personologic.

The continuing diversity of approaches may be a signal that managing mental illness is a genuinely complex problem. As such, it is distinct from the management of simple or complicated problems (Begun, Zimmerman, & Dooley, 2003; Minas, 2005; Bar-Yam, 2006). If we consider the continuum from simple to complicated to complex, we might choose the examples of following a recipe as a simple problem, sending a man to the moon as a complicated problem, and raising a child as a complex problem (Westley, Zimmerman, & Patton, 2006). Unlike fundamentally repeatable processes such as following a recipe or sending a man to the moon, parenting is a process that requires local and immediate responsiveness and individual care. There is no reliable formula, and it would be inappropriate to try to eliminate surprise. Although expert knowledge may offer insight, the individual situation cannot be replicated, parts cannot be isolated, uncertainty matters, and individual relationships play a central role. Moreover, the relationships and the individuals involved continue to evolve.

The training and research structures that support the pharmacological approach may be complicated, but the approach itself is surprisingly simple. Typically a single expert meets briefly with each patient and selects a combination of drugs from a few families based on the patient's mental state (antipsychotic, antidepressant, anti-anxiety, mood stabilizer, sleep agent, etc). It takes

extensive training to do well, but the selection of drugs is structurally more similar to following a recipe than it is to raising a child.

Some alternative approaches to mental illness have attempted to broaden our explanatory framework for disorders of the mind. The biopsychosocial model introduced by Dr. George Engel in his 1977 article “The Need for a New Medical Model: A Challenge for Biomedicine” posits that an approach compatible with the insights from general systems theory should supersede bio-reductionist accounts of mental illness (Engel, 1977). Proponents of the biopsychosocial model argue that “biological, psychological, and social levels are dynamically interrelated and that these relationships affect both the process and outcomes of care” (Pilgrim, 2002).

Recognizing that conceptual models influence the way in which practitioners approach mental illness, Engel argued it was necessary to work from models that are broad enough to capture the inherent complexities of a system. From this point of departure, he claimed that:

1. Mental illness occurs within individuals who are part of a larger system.
2. The system includes nested levels of increasing complexity ranging from groups of atoms to people, families, and societies.
3. Each level of organization depends on the levels below it but cannot be explained in terms of those levels.

Engel argues that approaches that explain mental illness only using sub-personal levels are by definition reductionist. This is problematic because it is partial and therefore scientifically inadequate, but also because it may offend humanistic sensibilities and the outcome may be dehumanizing (Pilgrim, 2002).

The biopsychosocial approach leaves open the option of building social systems that adapt to accommodate a variety of needs, and suggests that treatment should occur at different levels of organization, but it does not explicitly distinguish the capacity to maintain identity through disturbances from stability near equilibrium. As Holling pointed out (1973), these two characteristics may be antagonistic. The implications of this distinction are critical for

understanding how interventions in systems should be structured. Identity is different than current state and that is certainly true of the mind.

A Resilience Approach to Mental Illness

The resilience approach, originating in the ecology literature, offers a particularly rich language for describing rapid change, cross-scale linkages, and regulation through change. It looks explicitly at understanding patterns in complex adaptive systems. Holling introduced the model (1973) to describe the transient behaviour of ecological systems as they undergo breakdown and reorganization. Since that time, the approach has been used to derive insights about the dynamics of complex systems characterized by “nonlinear dynamics with thresholds, reciprocal feedback loops, time lags, resilience, heterogeneity, and surprises.”

The term resilience is widely used in the mental health field, but its most common meaning is in reference to the individual’s ability to ‘bounce back’ from a disturbance (Tugade, Fredrickson, & Feldman Barrett, 2004; Lalumière, 2006). In this sense “resilience” corresponds to cumulative “protective factors” that support positive behavioral adaptation to adverse conditions. It is used in opposition to cumulative “risk factors.” Resilience, in this sense, is enhanced by protective factors such as optimism, good problem-solving skills, and social support systems (New Freedom Commission on Mental Health, 2003). The narrow notion of resilience as an ability to ‘bounce back’ is termed “engineering resilience” in the ecology resilience literature (Folke, 2006).

In ecology, the resilience approach emerged as a response to the discovery, in the 1960’s and early 1970’s, of multiple basins of attraction in ecosystems. In this context, resilience is understood not as conserving a particular structure or resisting change, but as the capacity of a system “to absorb disturbance and re-organize while undergoing change” in such a way that it maintains its basic function, structure, feedbacks, and identity (Folke, 2006; Walker et al., 2004). It includes both the potential for the system to maintain coherence with itself, and the capacity for transformation.

Holling observed, in his seminal 1973 paper, that numerous systems experience long periods of growth and accumulation of resources alternating with periods of rapid breakdown and reorganization. He called this an adaptive cycle. Periods of breakdown disrupt the system, releasing resources and creating the opportunity for renewal and innovation. The resilience approach and the adaptive cycle may offer a useful way to understand the dynamic processes that characterize mental health. Although the approach originated in the study of ecological systems, recent work extends it to social systems (Gunderson, Holling, & Light, 1995). Among other things, it has been used to study social dynamics in New York following the fires and resulting housing losses of the 1970's (Wallace, & Wallace, 2008), the dynamics of resource dependence and exploitation in coastal communities (Adger, 2000), and leadership (Olsson et al., 2006; Westley et al., 2006).

Positive Disintegration

Whether the adaptive cycle can be literally applied to mental illness is an open question. Among the most striking examples of work in psychology that parallels the adaptive cycle is the work on positive disintegration by Kazimierz Dabrowski. Dabrowski was a psychologist who worked under the Nazis in Poland when psychiatry was illegal, and then continued his research under the communist regime. Though scientific exchange was limited at the time and his ideas about mental illness have remained obscure, he is the subject of a number of recent works (Battaglia, 2002; Mendaglio, 2008) and his ideas have been widely studied in the area of gifted education (Piechowski, 1991; Mendaglio, 2008; Silverman 2008).

He posits a psychological theory that resembles resilience theory. According to this theory, people may achieve higher levels of functioning by passing through periods of disintegration and reorganization (Battaglia, 2002). Within this framework, psychosis, for example, may be seen as part of the struggle to reintegrate the self more creatively based on will and intention rather than mere social conditioning. As in the adaptive cycle, breakdown can free resources for creativity and

make room for change. Based on this approach, he posits an alternate definition of mental health that challenges the emphasis commonly placed on stability and integration (Mika, 2008).

Dabrowski's positive disintegration is a theory of personality development. He argues that the personality is usually unified and when unified, the will and intelligence are one. Periodically, however, this cohesiveness breaks down through a process of positive disintegration. The potential for breakdown and positive re-integration can be understood in terms of four personality types. The first type, the positive disintegrated type, grows in the process of passing through breakdowns. In these cases, the individual can pass through breakdown and achieve a level of development as high or higher than before the disintegration. As Dabrowski says, "the development of the personality occurs through a disruption of the then existing integrated structure, a period of disintegration and finally a renewed or secondary integration . . . at a much higher level" (Dabrowski, 1964).

The negative disintegration type recovers but enters a lower state of development following breakdown, while the chronic disintegration type remains in a chronic, oscillating state of disintegration. The least integrated type of personality, the primitive integration type, includes psychopaths who Dabrowski claims are so tightly integrated and egotistical that they lack the capacity for reintegration and cannot move to higher or lower levels of development.

Dabrowski thus recognized that the process of positive reintegration may fail. In terms of resilience theory, this may correspond in some cases to traps and in others to alternate stable regimes. Along these lines, Rodrick Wallace (2008) speculates that certain kinds of health problems, including some developmental disorders, can be characterized as pernicious resilience regimes.

Study of a range of complex adaptive systems suggests that the stability landscape in mental health systems might have multiple basins of attraction. In Dabrowski's framework, schizophrenia is an adaptive process of breakdown and reorganization that can tip into a pathological state if people do not gain access to the mechanisms of re-integration and re-creation

of the self. In term of resilience, it may be understood as a kind of breakdown that is prone to tipping into an alternate adaptive regime.

Schizophrenia, for instance, is strongly correlated with genetics, but social and environmental factors also play a role. In a set of identical twins with the exactly the same DNA, one twin can develop schizophrenia even if the other does not. It typically develops in early adulthood and, although some people recover, once it develops it is very difficult to eliminate (Gallagher, 2001). Thus, the transition to the new schizophrenic regime is in some sense contingent on social and historical factors. Once the transition occurs, a person’s pattern of functioning fundamentally and often irreversibly shifts.

It may be that the onset of schizophrenia can be treated as a transition to an alternate regime. The sphere circling in one of the basins in the idealized stability landscape, Figure 3, illustrates such a stable adaptive regime. A small perturbation would not tip it out of its basin of attraction; however, a larger perturbation might send it over the ridge into a new regime.

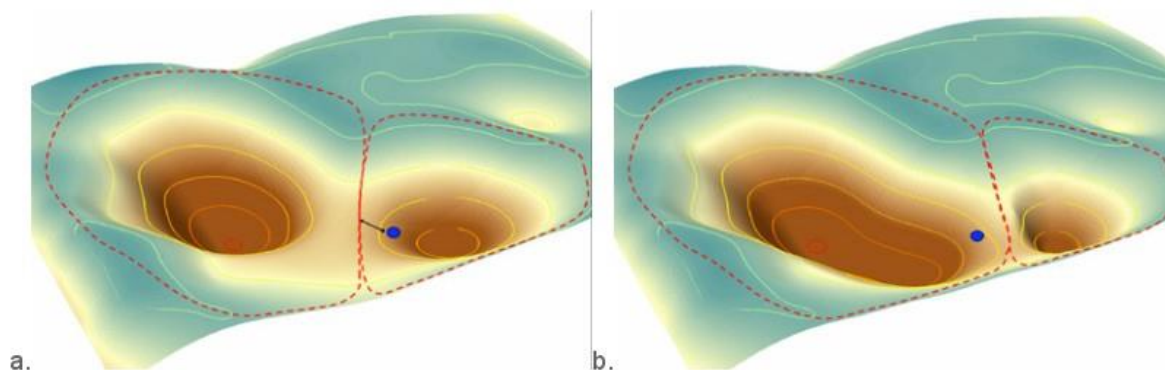


Figure 3: An idealized stability landscape representation of resilience. The system can change regimes a) as a result of a perturbation or b) if the shape of the basin changes (from Resilience Alliance, 2008).

C. S. Holling uses the term resilience to characterize the shape of the basin in the stability landscape. Flattening the basin makes the system less resilient in his terms and more prone to catastrophic change. Thus a deep basin can be positive or negative depending on whether the underlying regime is desirable or undesirable (Folke, 2006). In this sense, schizophrenia could be described as perniciously resilient.

Implications for Practice

The resilience model and notion of positive disintegration suggest that suppressing variability and establishing 'normal' states is not in general adequate for addressing mental illness. Variability and periods of breakdown and disorder are fundamental to the healthy functioning of complex adaptive systems. The suppression of variability in forest and ocean ecosystems to produce stable, rationalized outputs, creates its own problems (Walker, Holling, Carpenter, & Kinzig, 2004). This approach suggests that the suppression of the features that support growth and reintegration plays a similar role in psychological systems. Normalization reduces redundancy and the capacity for adaptation and innovation, and increases the risk of more serious collapse.

Instead of driving systems towards equilibrium, a richer adaptive approach that responds to individual needs should be used. Dabrowski saw mental illness as pathological only when the patient's capacity for self-help is not recognized. Dabrowski recommended supporting people in finding ways to reintegrate and develop, rather than structuring treatment primarily as a method of transferring expert knowledge. According to Dabrowski, passing through breakdown can support recovery and sometimes enable people to achieve a higher state of development.

In resilience theory, adaptive management is a responsive approach to supporting the healthy functioning of complex adaptive systems. Adaptive management is a structured, experimental approach to managing a system in the face of uncertainty (Walker et al., 2004). Instead of managing a system for consistent yields, adaptive management seeks to reduce the intensity or frequency of the failures or to provide support to make them less harmful. The goal of

adaptive approaches to managing mental illness would be to find ways to support people through periods of varying capabilities and enhance their capacity to reintegrate and recover from breakdown. For example, in the context of mental health, rather than being administered at a crisis point and suppressing cycling, drugs would be used with other approaches to stabilize people and support recovery rather than to suppress cycling altogether (Figure 3). Other institutions, such as sanctuaries or retreats, might also be used to provide space for rest and re-integration.

Recovery and the Capabilities Framework

Recovery and the capabilities framework are two approaches to adaptive management: the first at the level of the individual, the second at the level of society.

Recovery

The theory of positive disintegration suggests that the fundamental difference between the trajectories of illnesses is not in type but rather in the individual's capacity to develop. The goal then is not to suppress symptoms but rather to provide the tools necessary for reintegration and recovery. This may, in some cases, require supporting rather than suppressing breakdown. Dabrowski emphasized teaching people the tools so that they could reintegrate and recover.

The recovery approach, recently highlighted in the American Mental Health report (New Freedom Commission on Mental Health, 2003), appears to be consistent with this model. Unlike a cure for fixing people, recovery is something that people define in part for themselves. It may be relief of symptoms or it may involve an increased capacity to live well within the constraints imposed by the symptoms. Essentially, a recovery approach takes a responsive individual approach to managing individual care to maximize wellbeing. The approach originates in the consumer-survivor movement and the phenomenological tradition (Davidson, 1988). It emphasizes the powerful effect that slow variables like a home, access to nature, and

independence can have on people's ability to manage mental illness (Davidson, Borg, Marin, Topor, Mezzina, & Sells, 2005). The recovery model focuses on listening to people's experiences and giving control to those dealing with mental illness. In this sense, it is an adaptive approach. Researchers in the recovery tradition argue that the idea of cure should be supplanted by a richer notion of recovery that is based on individual experience and may involve cycling and breakdown. Recovery is not something done to people, but something they participate in.

The Capabilities Framework

Amartya Sen's capabilities approach suggests how different levels of organization can play a role in supporting positive disintegration. The goal is to structure support systems so that they provide the resources for recovery. This approach challenges the idea implicit in the pharmacological model that if the society and the individual are in conflict, the individual must change. The hallmark of capability theory is its focus on the opportunities that people have to achieve the things they want to achieve.

The theory includes 5 constructs: capabilities, functionings, wellbeing, characteristics, and exchange entitlements (Sen, 1985). Two of these, capabilities and functionings, are particularly important for understanding mental illness. Capabilities refer to ends or outcomes a person can achieve. Functionings refers to the various actions we perform in everyday life to achieve what we are capable of. Functioning ranges from achieving basic things such as obtaining food and maintaining health to more complex tasks such as achieving inner peace or performing leadership roles in the community. The notion of capability is essentially one of freedom. Persons with mental illness often lack these freedoms. A distinctive features of the theory is that Sen promotes an equality of capabilities and not necessarily an equality of functionings. Capabilities may be underutilized as a result of limitations in functioning that may be ameliorated socially by the strategic modification of public institutions.

For example, a person confined to a wheelchair may have capabilities that are limited by the lack of ramps in public buildings. Building ramps may remove the restriction on mobility

without getting people out of their wheelchair. The capabilities framework appears to provide an appropriate approach to evaluating the mental health system and possible changes to it. Controlling symptoms can increase capabilities, but capabilities are also amenable to modification by modifying social networks.

Social Innovation and Novelty

Fundamental shifts to these patterns depend on social innovation. Social innovation is a central mechanism by which we can modify public structures and institutions to produce more resilient systems and reengage vulnerable populations. It can help to create responsive systems of care; and a diverse, engaged population can, in turn, create more social innovation and more adaptive institutions and structures.

A-Way Express in Toronto is an example of an employment/mental health support structure that has been designed to support individual and community resilience. It is a non-profit transit-based courier service founded and staffed by survivors of mental health challenges. Employees deliver parcels on foot. The organization provides meaningful and supportive employment for people who might have trouble working in more rigid jobs. Schedules are set up to allow for some irregularity. Employees may be late or absent on occasion, and they may require particular kinds of support.

Because A-Way Express can handle the small breakdowns as people leave and return, the employee/employer relationship is more resilient and serious breakdowns are less frequent. This approach includes greater variability within the accepted range of normal functioning. It also increases community cohesiveness and reengages vulnerable populations.

The high tech consulting firm, Specialisterne, plays a similar role. Their consultants are considered the best in their field, paid competitive wages, and work for clients such as Microsoft, LEGO, and Oracle. What is unusual is that the consultants all have Asperger syndrome or some form of autism spectrum disorder (ASD). Specialisterne customizes the work environment and hiring process to the needs of the employees and provides specialized support

for the occasional disruptions, to eliminate the barriers that often prevent them from excelling in a corporate environment. The consultants have exceptional concentration and excel at the intricate, repetitive work of software testing (George, 2009). This approach moves beyond exchange entitlements, freeing up resources that would otherwise go towards supporting people and actually engaging vulnerable populations in creating new opportunities.

Work on social innovation emphasizes the role of agency and the possibility of intentionally exploiting system dynamics to achieve social changes that act across scales (Westley, Zimmerman, & Patton, 2006). Social innovation can play an important role in building structures and supports that allow for an equality of capabilities even while there is variability in functionings.

Conclusion

In this paper we have proposed a new interpretive framework rooted in the theories of resilience and positive disintegration for understanding mental illness. It is a framework that suggests an approach focused on change, discontinuity, and multiple nested levels of organization. It treats alternative stable states as natural and may actually value discontinuous change and surprise.

Under the pharmacological model, mental illnesses are treated as failures in normal functioning individuals that can be treated, often with drugs, and eliminated or suppressed. The drugs used may, however, produce side effects at the individual and the system level (Porter, 2002).

A resilience approach suggests that passing through breakdown can reduce rigidity in a system and help to prevent larger failures later on. Furthermore, if larger cycles can create conditions for recovery in low-level systems, then what may be needed are not just treatments for individuals, but fundamental changes in social structures and institutions. It may seem that we

should fix the breakdowns where they are found, but when we take account of the interactions among multiple levels of organization, it can be more effective to modify the larger support systems.

We argue that resilience theory when applied to mental illness has important implications for how to address mental illness cohesively to both maximize quality of life and cohesiveness and resilience of the larger community. We argue that the dominant pharmacological approach does not address cross-scale phenomena and does not adequately account for the role of discontinuity and transformation.

There are examples of innovations such as A-Way Express and Specialisterne which have had a profound impact at the local level and that indicate how we might modify larger support systems. As yet, however, there has been little effort to disseminate or use these radical models disruptively to challenge the broader institutions of society in an effort to change them. Expanding our interpretive framework to include multilevel systems that include variability and regulate through change can help us to understand and respond to the complexities inherent in the mental illness system.

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Author Biographies

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Kirsten is currently a McConnell Fellow with SiG@Waterloo. Kirsten began in philosophy before studying Systems Design Engineering at the University of Waterloo. Her current research is on designing distributed mechanisms and algorithms for responsive architectural membranes. Kirsten is interested in agent-based systems, complexity, and social change, particularly as they apply to stopping species loss and supporting the development of caring communities.

Frances Westley

Frances Westley is the J. W. McConnell Chair in Social Innovation at the University of Waterloo. Her research, writing, and teaching centers on social innovation in complex problem domains, with particular emphasis on leadership and managing strategic change. Her most recent book entitled *Getting to Maybe (Random House, 2006)* focuses on the inter-relationship of individual and system dynamics in social innovation and transformation. Dr. Westley received her PhD and MA in Sociology from McGill University.

About Social Innovation Generation

Social Innovation Generation (SiG) is a collaborative partnership between the Montreal-based J.W. McConnell Family Foundation, the University of Waterloo, the MaRS Discovery District in Toronto, and the PLAN Institute in Vancouver. It seeks to address Canada's social and ecological challenges by creating a culture of continuous social innovation. The project is designed to enhance the conditions for social innovation in Canada, including providing practical new support for social innovators in cultivating organizations and initiatives.

The SiG project is focused very specifically on social innovations that have durability, impact and scale. Our interest is on profound change processes and our overall aim is to encourage effective methods of addressing persistent social problems on a national scale.

To find out more, please visit www.sigeneration.ca.

About the University of Waterloo

SiG@Waterloo is an important partner in the national SiG collaboration and is housed in the Faculty of Arts at the University of Waterloo, recognized as one of Canada's most innovative universities. In just half a century, the University of Waterloo, located at the heart of Canada's Technology Triangle, has become one of Canada's leading comprehensive universities with 28,000 full and part-time students in undergraduate and graduate programs. In the next decade, the university is committed to building a better future for Canada and the world by championing innovation and collaboration to create solutions relevant to the needs of today and tomorrow. Waterloo, as home to the world's largest post-secondary co-operative education program, embraces its connections to the world and encourages enterprising partnerships in learning, research, and discovery.

To find out more, please visit www.uwaterloo.ca.



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