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## Emergence: A Closer Look at Theory and Application

As scientists, we seek resolution to our research inquiries both by attaining understanding and by unearthing explanations. Understanding has an ability to offer insight that extends beyond words and even language. Explanation is essentially symbol-bound and unfulfilled if the outcomes of inquiry fall short of logical and causal certainty. The intention here is to offer ways in which the conceptualization of emergence in eating disorders may be more easily understood, and that explanation of ‘emergence’ be recognized as justification and clarification for my interpretations and assumptions. This essay is divided into three parts: Part I will focus on theoretical concepts of emergence and introduce the three orders of emergence; Part II will examine emergence in eating disorders from a dynamic systems perspective and emphasize differentiating world view theories on topics of (1) self-organization, (2) circular causality, and (3) skills; Part III will present an elaboration on notions of Kurt Fischer’s skill theory and propose an interpretive application of the theory to emergence in eating disorders.

### **Part I.**

‘Emergence’ is a term used in the areas of Philosophy and Science that gives explanation to the development of complex organized systems; thus, it is a *central* (yet controversial) concept in the realm of complex systems. The ideas behind the term have been implemented since the time of Aristotle and have been examined, scrutinized and elaborately detailed over the years. G.H. Lewes, who coined the term “emergent”, wrote “Every resultant is either a sum or a difference of the co-operant forces; their sum, when their directions are the same – their difference, when their directions are contrary. Further, every resultant is clearly traceable in its components, because these are homogeneous and commensurable. It is otherwise with emergents, when, instead of adding measurable motion to measurable motion, or things of one kind to other individuals of their kind, there is a co-operation of things of unlike kinds. The

emergent is unlike its components in so far as these are incommensurable, and it cannot be reduced to their sum or their difference” (Lewes 1874-1879) (Blitz 1992). Perhaps the most sophisticated recent description was provided in 1999 by Jeffrey Goldstein, to whom emergence refers to “the arising of novel and coherent structures, patterns and properties during the process of self-organization in complex systems.” Taking into consideration this definition, Corning (2002) went further to elaborate on the common characteristics of the notion. Emphasizing supervenience, or downward causation, he claimed definitive commonalities of emergence “[include]: (1) radical novelty (features not previously observed in systems); (2) coherence or correlation (meaning integrated wholes that maintain themselves over some period of time); (3) A global or macro “level” (i.e. there is some property of ‘wholeness’); (4) it is the product of a dynamical process (it evolves); and (5) it is “ostensive” – it can be perceived.”

The concept of emergence may be divided into two categories, “weak emergence” and “strong emergence”. Weak emergence depicts new properties arising in systems as a consequence of the interactions at a fundamental level. In this case, emergence is merely a part of the archetype that is needed to describe a system’s behavior. Strong emergence is a notion more widely used in areas such as etiology, epistemology, and ontology. In this view, new qualities (not directly traceable to the system’s components, but rather to *how* those components interact) are irreducible to a system’s constituent elements; thus the whole is greater than the sum of its parts. There has been some debate about whether or not the whole can be predicted from the properties of the components, and about how strong emergence is logically possible, but awkwardly like magic. It seems astonishing that an irreducible, descending causal power can even arise, since by definition it cannot be due to the assemblage of the micro-level potentialities; there is a supernatural mysteriousness encompassing the idea that emergence

entails unlawfully getting something from nothing. However, this debate distracts attention from what should be emphasized, which is that “[w]holes produce unique combined effects, but many of these effects may be co-determined by the context and the interactions between the whole and its environment” (Corning 2002).

Subjective qualities of any system include the properties of complexity and organization that are determined by the observer. Identifying structure and discovering the emergence of complexity in nature are intrinsically subjective, though essential, scientific endeavors. An observer’s conception of what is deliberate and ordered, what is unsystematic and arbitrary, and what is complex in its environment depends directly on computational resources (i.e. amount of unprocessed data, amount of memory). More critically, the detection of structure in an environment depends on how those resources are organized. It is important to note that, as Corning (2002) argues, it is not mandatory that synergies be observed in order to qualify as emergent effects; even if no one is present to observe them, the synergies associated with emergence are real and measurable and quantifiable.

When several distinct components operate in an environment (forming more complex behaviors as a communal group) an emergent behavior or emergent property can appear. There are two key reasons why emergent properties occur: multifaceted causal relations across different levels and top-down feedback. The property itself is often spontaneous and unique, and may represent a new level of the system’s development. The complex behaviors or properties are not a property of any single such component, nor can they easily be anticipated or deduced from behavior in the lower-level components -- they are irreducible. Why is emergent behavior so difficult to predict? One explanation is that the number of interactions among components of a system increases combinatorially with the number of components, which potentially allows

many novel types of behavior to emerge. Not only the number of connections between components encourages emergence, but how these connections are organized encourages emergence as well. A hierarchical organization can produce emergent behavior, but it can also arise from more decentralized organizational structures. In some situations, the system has to reach a mutual threshold of variety, regulation, and connectivity before emergent behavior appears.

The concept of emergence represents an ontological simplification of gestalt theory, beginning with the assessment that a whole is different in kind from the parts that construct it. Emergent properties arise either vertically - when components are integrated to generate a whole with dissimilar properties than its parts, or horizontally - when adequate amounts of a given component are combined to produce joint properties different than the properties of a single or a few of the components in seclusion. The joint interactions between the relational properties of components (which exist in a local system of organizational principles at a certain emergent level) cause what next occurs in that system. In other words, they establish the developmental history of a given component. The relational properties and laws regulating an emergent whole's functioning in a system are disengaged from the properties and laws governing its components. As a result, the qualities of the higher level cannot be justified by reducing them to the properties and laws of its lower level components. The components reinforce-but do not cause-the properties of the whole.

Emergent structures are not configurations created by a single event or rule (i.e. there is nothing that instructs the system to form a pattern). Instead, the interactions between each component with its immediate setting cause a complex progression which leads to order. The interaction of these components is crucial: emergent structures are more than the sum of their

constituents because the emergent order will not develop if they simply exist simultaneously. It is important to differentiate three forms of emergent structures. Here, I will only provide a brief breakdown, as a more in-depth examination will be provided later. First-order emergent structures occur as a result of shape/form interactions. A common example is how hydrogen bonds in water molecules lead to surface tension. First-order emergence serves no center. Second-order emergent structures involve shape/form interactions occurring sequentially over time (for example, varying atmospheric conditions change a snowflake's figure as it falls to the ground). Second-order emergence serves living centers. Third-order emergent structures are a consequence of shape, time, and inherited directives (for example, a genetic code sets marginal conditions on the relations of biological systems in space and time). Third-order emergence serves symbol application or symbolically composed centers. Various types of causality are located within and between each order; bottom-up and top-down causation may take place across ontological levels and between orders. For example, the onset of diabetes produces specific first-order chemical changes, has a second-order etiology, and impinges on third-order human experience. First-order emergence is the skeleton on which second-order emergence is built, and third-order emergence presumes the first two orders. Deliberate action is only possible because of the reinforcing functions of first and second-order emergence. Evolution, being the central theory behind life, is the main reason for the growth of complexity in the natural world. Therefore, in considering the emergence of complex living beings, we refer to processes of sudden changes in evolution. An emergent level is a key factor in evolutionary advancement: components with exclusive sets of emergent properties are incorporated with other components having distinctive properties to create yet another component with its own unique characteristics.

A hierarchy of phenomena emerges as one proceeds in time or expands the range of inquiry; thus, emergence symbolizes complexity's stepping stones.

*First-order emergence in the Dynamo-Physical World.* “If the Big Bang is considered as the creative source of the cosmos, the first order of emergence is the world of matter-energy – what we have been referring to in traditional terms as the physical world” (Gulick 2006). The term “dynamo-physical world” precisely conveys how (under appropriate circumstances) matter and energy are transposable, revealing the significance of event and process. Our world exists as a system composed of highly complex, hierarchical, locally coordinated structures; a world in which there are many contextual regions but no center. This world, as an assembly of components and occurrences and experiences with no evident center, is best distinguished in terms of systems theory. This perspective assumes that for a component at any single level of emergence, there are innumerable levels of no absolute causal significance; furthermore, it suggests that at a particular level only components and forces existing in a specific context are likely to have any causal influence. In the dynamo-physical world, some of the contexts are in states of static equilibrium, some in dynamic equilibrium, and some in disequilibrium, and within these different states, there are various forms of causation. Of course, general scientific laws (i.e. laws of physics and chemistry) as well as organizational standards operate throughout the dynamo-physical world. It is crucial that one look beyond these general laws to the relevant contexts (which are characterized systemically as developing, environmental wholes existing at a certain ontological level) when seeking specific instances of causation. Although much more is involved in causal analysis, some essential concepts to focus on are relational properties, situational energy sources/forces, and organizational principles. It has been suggested that the relational properties prominent in a particular context (in either static or dynamic equilibrium)

are not causes, but rather *contributing influences*. When examining the system as a whole, the apparent task of all the components is that of maintaining an existing state rather than causing a new one; thus, there is difficulty in claiming such supportive features ‘causes’. Also making it difficult to identify individual causes are the influences of relational properties – which integrate, rather than sum up, to form a whole. Negative and positive feedback loops are responsible for sustaining the stability of any context in equilibrium; additionally, the context is a positioned whole in relation to other wholes and subject to both top-down and bottom-up manipulation. The components within the context have dormant qualities that can become active if environmental changes elicit them. *Active causes* are the occurrences that not only play a part in continuing disequilibrium, but that also aid in disrupting a system that is in equilibrium. These less evident causes may be catalytic in nature, as they enhance reaction rates by providing new reaction channels with decreased activation energy requirements. It is important to note that organizational principles, which are as significant and essential as active causes, are extremely subtle, indescribable, and defiant to classification.

*Second-order emergence in the Biological World.* The emergence of ‘life’ builds slowly, progressively, and cumulatively through several phases. One crucial indication of ‘life’ is the possession of a center - an organizing process that has a purpose. Another necessary function of ‘life’ is that the centers must be able to reproduce themselves and forward the information about replication processes on to future cohorts of these centers. Thus, reproductive capability and genetic inheritance are emergent attributes of ‘life’. The operations that make ‘life’ possible are reliant on signals that function to disclose information not only of conditions and situations in the world beyond, but also of needs within the centers. Unlike first-order emergence, in second-order emergence there is receptiveness and ambition. In the biological world, living beings

search for environments with relational properties that permit prosperity both passively (e.g. receiving environmental signals) and actively (e.g. through capacities such as mobility). Living beings serve as active causal forces insofar as they come into environments as external change agents. Once recognized in an environment, living beings can be reciprocally conducive to an enhanced ecological existence. *Efficient causality* is a pre-articulate form of intentionality that is characteristic of the self-centered action of living beings, and *signal initiated stimulus and response* is another type of causality surfacing in the biological world.

*Third-order emergence in the Human World.* Human beings are the only known occupiers of all three orders. “Human existence depends upon the organizational principles, relational properties, and forces of first-order emergence; the anatomical structures, physiological processes, and signal responsiveness of second-order emergence; but also the language, culture, and technology of third-order emergence” (Gulick, 20). Lerner (2002) examines third-order emergence in psychological levels, noting that at higher levels, humans are capable of intersensory integration (the ability to transduce information from one sensory mode to another). A human being, because of high psychological levels, has the means to develop substantially through sensory experiences; regarding emergence in eating disorders, this is evident in the person as intersensory integration contributes to the advancement of emerging novel skills. Symbol-based thought, action, and language are also of utmost importance in third-order emergence, as they make causal foundations and management achievable in a way that is not possible for other living beings, much less in natural processes. The ability to identify symbols through the use of language and vocabulary gives humans awareness of and control over the dynamo-physical and biological worlds. As signals connect one to experiential and practical reality, scientific inquisition provides humans with expertise and power. With the

capacity to abstractly expound needs, morals, and desires, humans enhance the ability and potential of intentions. Linguistically structured expectations may encourage motivation (a causal force influencing human behavior) and lead to premeditated, deliberate action affecting the world as an active cause. Because motivation and planning are based in the boundless use of verbal communication and decision making, their causality is completely unlike the deterministic causality of the dynamo-physical world. There are several significant achievements of symbol-based thought worth noting. The first is the intentional causal power of an individual. Intentions are created as strategies for active engagement, and when they are achieved, an improved form of experienced causality transpires. The implication of authority/control in this incident of causality has significantly influenced theories concerning the nature of causation. The ability to function as an active cause has inspired humans to accentuate specific sources of causation, rather than recognize systemic alterations in first-order emergence as a natural and environmental incorporation of all the relational properties and forces. That is, the distinctiveness of words in language emphasizes the inclination of humans to seek explicit causal factors in the dynamo-physical world. Intentional action is the foundation of personal responsibility, an aspect of causality that occurs only in third-order emergence. Rationality and responsibility are reliant on the unrestricted options made available through the utilization of symbols. The second achievement of symbol-based thought is grounded in the notion that symbols have a social and collective existence supplementing their private usage. Symbols have numerous significant features in their essence, including a specific dialect that is at the core of every symbol system. The expressions, terminology, and grammar of a particular language have an effect on how and what is imagined by a person. There are also the many traditions and institutions that cooperatively shape the cultures (which themselves are characterized by a

uniformity gained through practiced lifestyles and embedded expectations) into which people are socialized. Additionally, symbols bring about technological innovations (e.g. writing) that have an effect on how humans live and thus greatly impact human behavior. Causation contingent on symbol usage is totally different from first-order and second-order causation. In contemplating the causal force of symbols, it is evident that symbols have the capacity to drive and shape human behavior, and that the signaled responsiveness of the biological world is more compatible with social and cultural causation. When a person understands how to survive in the world, that person becomes consciously aware of how cultural symbol signals persuade her/him to behave. The symbolically organized information may serve as a traditional symbol leading to predictable thought and action, even if it is not considered a signal.

## **Part II.**

In my estimation, the dynamic systems perspective (DSP) offers an impressive *narrative* framework for emergence involved in eating disorders, with its dual focus on developmental universal order and on the particulars of real-time task-specific contexts. At this point, I will attempt to show that DSP can be successfully applied when examining emergence in eating disorders by emphasizing comparable associations to the concepts examined in “The Dynamic Systems Approach as Metatheory for Developmental Psychology” by David Worthington (2006). The ways in which the dynamic systems approach attempts to clarify how developmental patterns surface and evolve by using systems concepts of self-organization and holism are useful in considering the complexity of emergence in eating disorders. I will be evaluating my assumptions from an integrated metatheoretical standpoint that combines the contextualist and organismic world views, as “[t]his camp, by virtue of its world view merger, fully admits higher-order forms into its explanatory framework, integrates emergent pattern into

the nexus of causal relations, embraces all forms of causality – efficient, material, formal, and final – as distinct but legitimate types of explanation, considers developmental time as emergent from but irreducible to real time, and regards the process of self-organization in both bottom-up and top-down terms via circular or interlevel causality” (Witherington, 6). Hopefully this will provide for a better understanding of the complicated processes involved in emergence. But before considering a combination of the two, I feel it is necessary to examine how each world view separately contributes to and illustrates my assumptions regarding the emergent processes in an eating disorder.

The organismic world view considers the organism an irreducible, integrated whole whose development is signified by irreversible, progressive, and qualitative changes. Consider a person (the whole) in the most advanced stages of an eating disorder. This person is demonstrative of the “irreversible changes” in that the ‘stages’ of an eating disorder cannot be reversed. A woman who has the ability to purge just by thinking about it cannot regress back to the point in time when she *had* to spend an hour with her finger in her throat to rid herself of food. She cannot ‘unlearn’ the skills that have already been acquired through emergence in the disorder. These improved skills are not reversible – she cannot break them down, ‘forget’ how to use them or reverse their abilities. Additionally, the emergent changes in an eating disorder are progressive. As time proceeds, the individual learns to be more advanced in the psychological management and utilization of the collective skills that comprise the disorder – she (as a self-organizing whole) modifies current skills which allows for the emergence of new, more efficient skills. Lerner (2002) explained the qualitative aspects of transformation in emergent changes as alterations in what exists rather than in how much exists. The meaning of the disorder to its possessor may change, resulting in the qualitative changes that are characteristic of

emergent patterns in eating disorders. As qualitative changes are discontinuous by nature, an emergent, epigenetic change is always an instant of discontinuity. And not only is an emergent change an irreducible change, but it is also characterized by gappiness. Lerner (2002) justifies developmental gappiness as a consequence resulting from a lack of an intermediate level between earlier and later levels of development. The existing skills in the eating disorder are altered as the meaning of the disorder changes; when a skill no longer serves the purpose for which it originally emerged, or when new purposes arise, the gappiness is filled by developing novel patterns (acting as the intermediate level ‘occupier’) until a new skill emerges. The qualitative change in the meaning of the eating disorder is indicative of the individual’s implicit need to satisfy a new drive with a new skill. Changes in the meaning of a skill lead to changes in its functioning that contribute to the system as a whole, and because these changes make the skill qualitatively different from what it was before, it can never be degenerated to the skill it used to be. The contextualist world view plants itself in the now – in the real-time activities of the individual in specific situations or contexts of the moment. The skills that comprise an eating disorder are grounded in the here and now. For example, a bulimic might purge (the skill invoked) following an extremely stressful situation (specific circumstances or context), such as eating a meal in public (the real-time activity). To a person with an eating disorder, there is so much anxiety and stress associated not only with eating and food, but also with certain settings and circumstances. Just as contextualism places emphasis on context, the holism facet of the organismic world view suggests a contextualization of parts in terms of the whole. This contextualization of parts implies that the meaning of a singular component or skill in a system is above all else a function of its establishment within the system of a whole.

Consider this illustration: the eating disorder is the comprehensive whole, and the different skills represent single components of the system. The sole purpose of each skill is to function separately, carrying out processes that satisfy its own specific meanings. The skills contribute (as unique, functioning components) to the system (all the skills co-existing and co-functioning) of the whole (the eating disorder); thus, the eating disorder is maintained by the distinctiveness of each skill's purpose and functioning. One skill (laxative use) co-exists and cooperates with another skill (induced vomiting) as well as with another skill (exercise) and finally with another skill (restrictive eating). Each of these skills serves an exclusive purpose – each gives certain meaning to the system of the whole. Laxative use functions to rid the body of fluid. Taking laxatives dehydrates the body, which is one contributing factor to weight loss. The meaning of this skill (to make the person feel thin by avoiding fluid retention) is satisfied by its functioning (dehydrating the body). Induced vomiting functions to rid the body of consumed food. This prevents the absorbing of calories in food that has been eaten, which is another contributing factor to weight loss. The meaning of this skill (to make the person feel thin with a gratifyingly empty stomach) is satisfied by its functioning (draining the stomach). Exercise is a skill that functions to shed pounds of fat and muscle from the body. Extreme exercise burns many more calories than are consumed, and represents another contributing factor to weight loss. The meaning of this skill (to make the person feel thin by being physically toned and slim) is satisfied by its functioning (burning calories). Restrictive eating functions to limit calorie intake. Stringent regulation and restriction keeps calorie ingestion at a minimum, therefore denoting another contributing factor to weight loss. The meaning of this skill (to make the person feel thin by being able to prevent weight gain *and* cause weight loss) is satisfied by its functioning (monitoring/restraining the number of calories ingested). It is evident how each skill uniquely

adds to the comprehensive eating disorder by independently satisfying their respective meanings in collaboration with other skills. As long as the skill satisfies the meaning and contributes as a part of the system to the whole, that skill is maintained.

Both world views (organicism and contextualism) are relational points of view in that they accentuate the relations and interactions that occur between components of a system. This is important when looking at emergence in eating disorders. The relations that exist between the different skills in the system (i.e. the working relationships among the skills that are based on the specific meanings and functions of each skill) operate in order to constructively produce the whole that is valuable and beneficial to the person. The developmental processes that exemplify the emergence in eating disorders may be evaluated as a dialectical progression of organization, which is consistent with essential features of the organismic world view. Emergence occurs as a result of a structured, progressive advancement through the stages of thesis (theories or ideas about the different practices or skills that may be employed for a ‘successful’ disorder), antithesis (utilizing different skills and comparing skills used in the past to current ones to ascertain what works most effectively), and synthesis (fusion of effective skills to improve the efficiency of the eating disorder in the future) in accordance with the principles of dialectical progression. This aids in providing a proper explanation of emergence because it establishes order and organization into the area of exploration. For contextualism, the developmental processes that are involved begin with the current event of a precise action in a particular context and proceeds to other events past and in the near future. The immediacy of the present to which contextualism so faithfully adheres is highly informative of the effective processes of skills in an eating disorder. Consider a situation in which a person purges by inducing vomiting. That particular experience of purging – here and now – is compared to an experience of purging in the

past. By psychologically comparing the two experiences, the processes/outcomes of the skills are closely evaluated by the individual, who then modifies the processes which will directly affect the processes/outcomes of the skills in future purging experiences. It is also important to note is that the events are all fundamentally complex as they are a compilation of interrelated activities with continuously shifting patterns. Acts such as bingeing and purging are extremely intricate because within each act are interconnecting multiple facets that give importance and definition to the act itself while constantly contributing to the changing of patterns for more efficient use. Here, emergence lies in the context of here-and-now, because both organisms and the contexts within which they serve undergo persistent transformations in relation to one another. As Overton (1991) explained, “[u]nderstanding development simply requires a grounding of analysis in the variability action demonstrates during real-time, adaptive encounters with everyday contexts, for development is continuous with such real-time change, moving from particular to particular.” The variation of skills used by a person with an eating disorder demonstrates the adaptive functioning (psychological and physical) of that individual to adjust to new contexts in everyday life. For instance, a person might choose to severely restrict calorie intake while on vacation with her/his parents because she/he may be unable to utilize other skills to maintain the eating disorder (i.e. she/he cannot retreat to the bathroom to induce vomiting after every meal as the parents may become aware of what is occurring and try to intervene). So to effectively sustain the disorder, the person is able to use a variety of skills while adjusting to adaptive encounters within divergent contexts.

From an organismic perspective, analysis is a top-down process, whereas from a contextualist perspective, analysis is a bottom-up process. In addition, the contextualist world view advocates a “horizontal cosmology” that attaches importance to the *flattening* of all systems

that depend on numerous, vertically structured levels of analysis or organization (i.e. skills), and thus discards the notion of hierarchy entirely. This “horizontal cosmology” is useful in depicting how the many functioning skills interact on a horizontal plane within the system; in thinking of the eating disorder’s system as hierarchical, it can be misunderstood that the skills are ranked in order of importance or effectiveness, when actually none is more or less important or effective when looking at the whole. Each skill on this horizontal plane functions exclusively and cooperates with other skills to contribute equally to the comprehensive eating disorder.

Organismic-contextualist DSP recognizes the explanatory magnitude of both the “formal abstractions of organicism” and the “real-time particularities of contextualism” (Witherington 2006). As separate world views, organicism and contextualism both serve as self-sufficient metaphorical systems, each in their own right, in analyzing emergence in eating disorders. However, when contextualism combines with organicism, the integrative design takes priority and the categorical contexts act to identify and convey in detail the nature of the organic whole. This is evident in the avocations of “developmental range” structural accounts as opposed to “fixed level” structural accounts: “fixed level” structural accounts rely on distinct, abstracted forms to coordinate our awareness and understanding of behavior across a diversity of contexts, whereas “developmental range” structural accounts call upon multiple levels of abstracted organization to portray the range of functioning that occurs under changing conditions of contextual bases. As illustrated by Lerner (2002), new features emerge from the interactions within the current stage *and* between the current stage and its environment. In looking at emergent skills in an eating disorder, the convening and interactions of the numerous skills collectively depicts the breadth of functioning that occurs in changing environmental, cultural and situational conditions within contexts. Overton (2006) recommended a “relational

developmental metatheory” that expresses ontological differences in dialectical terms, as “differentiated polarities (i.e. co-equals) of a unified (i.e. indissociable) inclusive matrix” (p. 33) to represent uniquely separate, yet relationally unified, viewpoints. This recommendation is effective in reflecting upon the concept of causality, making it possible to be perceptive of this notion from discrete perspectives with exclusive features that are typical and demonstrative of the same whole.

Dynamic systems perspective fully sanctions multi-component, nonlinear interaction and relations as the basis of emergent form. Complex patterns are derivations of the uncomplicated equations of nonlinear dynamics. These equations make available a unifying construct for appreciating change in all its complexity, and award pragmatic and experimental legitimacy to classic systems principles such as holism and emergence. They also illustrate the necessary operations and responsibilities that many individual components of a system perform (placing emphasis on each of the numerous skills and the functions that are required to satisfy their specific meanings) while dealing with one another (interaction of the skills within the system of the comprehensive eating disorder) to produce emergent pattern (generate original skills with novel meaning to serve innovative purposes within the system). No single component is responsible for a system’s emergent behavior and organization; rather, each component (i.e. each skill with its specific functions) is an essential, fundamentally connected element involved in the systemic self-organization of the whole. The skills in an eating disorder (laxative use, induced vomiting, exercise, and restrictive eating) are not sole creators of new skills; instead, the interacting and co-operating of skills within the system is accountable for the qualitative differences from which novelty emerges. This is illustrative of the very essence of the

comprehensiveness of an eating disorder - of how complex skills within systems emerge from simpler ones and how stable wholes are irreducible to any singular component of the system.

As quoted by Lerner (2002), Thelen and Smith explain the arrangement of novel forms by processes of self-organization in which “pattern and order emerge from the interactions of the components of a complex system without explicit instructions” (p. 170). Thus, the nature of self-organization is epitomized by emergence in a system, in that the creation of new patterns/forms occurs as a consequence of interactions between components that make up the system. A comprehensive eating disorder, as a self-organizing whole, is exemplified by emerging new patterns/forms (i.e. novel skills) resulting from interactive processes (co-functioning and co-operating) between the components (i.e. current skills) in the collective systems of the whole. Increasingly complex skills in the system can emerge from the networking among the existing skills. Skills interact with one another in order to better themselves which in turn betters the whole. Individually functioning skills co-operate to develop new and improved skills that are more advanced and able to satisfy the components’ contemporary meanings thus contributing to the self-organizing whole. By supplying an exemplar for comprehension of developmental change, self-organization illustrates change that is fixed in both all-inclusive elements and specifics, as well as “in change that is both orderly and irreversible, and variable and reversible” (Witherington, 16). The conceptual orientation provided by self-organization, articulating developmental transformation through the recognition of emergent novelty, illuminates two general centralities. Firstly, a concentration on emergence as the foundation for system development is employed, rather than a focus on design. This is important in the examination and analysis of eating disorders, as emergence is a crucial feature in the developmental exploration of the ‘becoming’ of the disorder. Secondly, as the source of developing form within

a system, attention is applied to the relations between components of a system rather than on the components themselves. In investigating a system composed of developing skills or patterns, the relational aspects among the existing skills are very revealing. These relations illuminate ways in which the novelty emerges and supplies us with insight as to how the novel form functions according to its evolved meaning. Current skills of the comprehensive eating disorder interrelate (these interrelations lead to new methods of fulfilling a purpose) and as a consequence, the novel skill emerges, and serves a specific function according to its newly specified meaning. As this new skill incorporates itself into the system, it also begins relational processes with co-existing skills, which in the end will lead to the emergence of yet another novel skill. There is no pre-existent design for the skills; they develop to satisfy the functional deficiency of current skills. Therefore, novelty within the system is unpredictable as it emerges solely to satisfy new needs.

The symbolic framework of self-organization employs a relational outlook in the revelation of form in that the associations that exist among skills in a system (not the skills exclusively) are the fundamental constituents of inquiry for studying development. In examining the emergence of novelty from a relational viewpoint, it is essential to deny any ideas involving only singular components of efficient causality. An eating disorder is multiply determined, with each skill (consisting of unique methods for functioning according to meaning) an essential interactant in the cooperative facilitation of change (i.e. change that produces an improved skill) within the system as a whole. The novel skill is irreducible to the elements from which it emerged, because the new, unique characteristics are not included in any of the current components that comprise the system. As Witherington (2006) notes, “[e]fficient cause, thus, becomes distributed across multiple components of the system such that each component influences the emergence of form without determining it”. So, each skill within the system

contributes uniquely and without predisposition to the emergence of advanced skills. It is easy to conceive a comprehensive eating disorder as a self-organizing system and irreducible whole, as the skills cannot be defined independent of the system. For example, the skills described earlier (laxative use, induced vomiting, exercise, and restrictive eating) are not distinctly explanatory if viewed independently of the comprehensive eating disorder. Laxative use, when considered alone, has no relevance to the understanding of the whole disorder. Rather, the relations that compile the system are exemplified by incorporation among skills. The skills in the eating disorder are intrinsically interrelated with their distinctiveness dependent on contextual factors, including both the horizontal context of relations that exist among parts (i.e. the ‘horizontal’ plane where co-existing and co-functioning between the skills occurs) and the vertical contexts of relations between part and whole (i.e. the ‘vertical’ plane where the co-existing and co-functioning skills directly effect through their functioning the comprehensive eating disorder). Linear deviation is the central point of holism that signifies self-organization.

To fully describe the developmental process, it is important to recognize not only the emergence of novel form that operates to sustain and adapt organization, but also to clarify the nature of development through the merger of “transformation” and “conservation” (Witherington 2006). The issue of ‘novelty status’ is usefully structured in terms of circular causality, which is a common trait of self-organizing systems. Considering the comprehensive eating disorder, circular causality may provide insight to the following inquiries: in what instant of systematization does novelty emerge, what capacity of organization is maintained, and what explanatory function does it serve in successive developmental processes (such as in the advancement of the skill)? Circular causality specifically stresses the importance of interlevel causality (distinct from horizontal, intralevel causality), which is the vertical causal interactions

that occur between lower-order skills and higher-order emergent skills. In circular causality, bottom-up processes (i.e. part-part interactions) occur when components collaborate with one another to create higher order systems. Representing a distinguishing feature of emergence, the skills that act together in a system of the eating disorder interact to form more advanced systems. Through part-part interactions with each other, the product is the emergent, novel skill equipped to successfully function within the now superior system. Top-down processes (i.e. whole-part interactions) persist and perform in terms of constraint (i.e. the components are strictly managed and controlled by the emergent wholes) by providing a directive, organizational structure to govern its constituent parts. Witherington (2006) notes that “[o]nce a novel whole emerges, the very natures of the components that comprise the whole must always be defined, at least in part, in terms of the higher-order whole in which the components are embedded.” The nature of each skill in the eating disorder is defined in terms of the meaning and function that that skill serves to the disorder. The management methods involved in induced vomiting are utilized for and defined by the meaning of that skill (to have an empty stomach), serving a specific purpose to the higher-order form – the comprehensive eating disorder. By modifying the preceding potential possibilities of the component’s behavior, emergent forms systematize component development and the progressions that produced them. The methods/techniques of a specific skill are useful and valuable until they no longer fulfill the purpose or meaning; when this happens the skill further develops, becoming more detailed and specifically modified to satisfy the meaning. This process gives rise to a novel skill, a more advanced and constructive component, that is able to function within the system of the whole – a whole that regulates its developmental processes through self-organization. An eating disorder serves a specific purpose in a person’s life – it has a meaning – it has developed for a reason. So, the disorder regulates the processes of its system

– of the co-functioning of the skills. The disorder ‘oversees’ the beneficiary products of the interactions between the skills, and thus is able to govern the processes so that they may be successful in fulfilling whatever meaning they emerged to serve. If at some point the interactions among skills are not as effective as they should be, modifications of the skills could lead to improved functioning to better satisfy meaning. For instance, a person that takes 3 laxatives a day and purges only after dinner realizes that even though some weight has been lost (which is the purpose - utilizing the disorder is in fact producing desired effects), modifications of the skills could lead to improved effectiveness of the disorder. So, she/he alters both the laxative use skill and the induced vomiting skill by increasing the number of pills per day to 6 and purging after every meal. These alterations make possible the fulfillment of purpose of the eating disorder. As the ‘meaning’ or reason for the eating disorder changes, the comprehensive whole (by regulating the processes of its systems) modifies individual skill ‘behavior’ or function, therefore altering the interrelations between them, in order to satisfy the new meaning of the eating disorder. This illustrates the establishment of higher-order forms within developmental levels of organization into the causal patterns of self organization.

In theory, circular causality can be relevant to *any* given level of organization, from the emergence of higher-order form (which I have just described) to the emergence of concrete behavioral content. At the level of behavioral content, self-organization engaging circular causality is demonstrated in induced vomiting. Groups of activators (i.e. gag reflex, mental thoughts/images/provocations, contraction of stomach muscles) act together in a task-specific context (i.e. purging), giving rise to a purposeful reciprocity and collaboration. Once conceived, these joined forces have managing power over the lower-order organizations that give rise to them. Considering the notion of circular causality with a concentration on “real-time action-in-

context” is consistent with “contextualism’s emphasis on holism and synthesis in the here-and-now” (Witherington 2006). In providing explanations for higher levels of organization embedded in behavioral content, it is useful to take into account circular causality because it encourages the investigation of meaning, functioning, and developing across a variety of contexts.

### **Part III.**

I find the application of Fischer’s skill theory extremely useful in examining the dynamic relations between the person and her/his context in the emergence and development of skills involved in eating disorders. Although the interpretations and assumptions I present may be debatable to some (since the theory is actually applied to the high psychological levels of ‘thinking’), I feel that Fischer’s theory serves as an innovative perspective for exploring and understanding emergence in eating disorders. The standpoints of Kurt Fischer and his colleagues are focused on self-organization and abstain from arguments of predesign. They also emphasize the significant importance of relations among system components in the emergence of novelty; however, their justifications involve higher levels of organization in the explanation of form. Even though they repudiate the application of invariable notions of form that depend on structural organization, they do not fully reject the usefulness of form in explaining development. Instead, Fischer and his colleagues endorse the incorporation of pattern explanation into a dynamic systems perspective; they suggest that psychological categorization establishes the organizational features of activity within dynamic systems. This psychological categorization includes self-motivated patterning and connecting of skills that sustain the organized activities. Witherington (2006) mentions their acknowledgment that a system is arranged and ordered when “specific relations exist among its parts, subsystems or processes... These relations include part

and whole” (Fischer & Bidell, 1998). In elaborating on the concept of ‘skill’, Fischer and Bidell suggest that skills are significantly and effectively assimilated with other skills, and are organized in a managerial hierarchy by incorporating former skills into a more inclusive whole. Through the process of assimilation with other skills, they become inferior to novel forms of organization and reciprocal regulation. The development of new skills through self-organizing synchronization brings about a “multileveled hierarchical structuring of living skills” (Fischer & Bidell, 1998). With a focus on organismic integration and real-time context grounding, Fischer and Bidell clearly employ an organismic-contextualist approach. Consequently in their view, the significance of interlevel causality is retained; with regards to circular causality, higher levels of organization are essential elements in the explanation of systems. When evaluating the distinctions between microdevelopment and macrodevelopment, they conclude that the former engages in development by which explicitly detailed skills emerge in real-time contexts, whereas the later implicates the incorporation and universality of skills across contexts.

Microdevelopmental processes lead to macrodevelopment (which is itself the irreducible, patterned whole). Fischer and Bidell (2006) write that macrodevelopment “is not simply an atomistic heap of many microdevelopmental processes but the cumulative process in which all the micro processes participate...micro and macro processes are intrinsically related and interdependent...neither can exist without the other, but neither can be reduced to the other.” Throughout their analyses and discussions, Fischer and Bidell repeatedly stress the reciprocal quality of interlevel relations in that “macrodevelopment is characterized by unique, ontologically real phenomena that emerge from microdevelopment and frame by means of constraint those very microdevelopmental phenomena” (Witherington, 36). The idea of dynamic skills can be represented by envisioning a person as an active agent in her/his own development

– as a self-motivated constructor of cognitive abilities that allow her/him to stay the same or change.

To illustrate the concepts and notions of skill theory in a *broad-spectrum storyline*, I will provide a detailed example of how these might apply to the emergence, maintenance, and progression of skills in an eating disorder. Consider a woman who internalizes familial/societal expectations and pressures to be thin. In the early stages of the disorder, she measures her options on how to lose a little weight. She begins taking laxatives, two per day. She realizes that by taking laxatives, she is retaining less fluid, which in turn makes her feel thinner. She continues this behavior, and thinks about other ways to lose weight. She soon starts dieting – eating healthier foods, cutting back on sweets, etc. As a result, she loses a little more weight. So far, the co-functioning of the two basic skills is fulfilling individual meanings and producing desired effects since they participate together. As time goes by, her weight stabilizes and the effectiveness of the skills is not as evident. Her body has built up a slight tolerance to the laxatives, and as a result, she is not releasing as much fluid. Also, her dieting (as it is) is no longer contributing to weight loss; rather, it is only maintaining her current weight. Consequently, she is now feeling that her weight loss approaches need to be modified a bit in order to continue being effective. So, she increases the laxative dose to four per day and becomes stricter in her diet, not consuming more than 1500 calories a day. These skills have been improved – by cognitively managing expectations and outcomes she is able to make appropriate adjustments for a more effective result. Here, another skill emerges in context – exercise. As she is taking the 4 laxatives per day and consuming a maximum of 1500 calories, she realizes that exercising will contribute to more weight loss. She starts exercising two times per week, while maintaining the other skills. Working together, these three skills are effective –

until another stable period occurs, in which there is no weight loss. Realizing the stability of her weight, she modifies the skills yet again. Instead of only taking 4 laxatives per day (all at once), she starts taking 4 in the morning and 2 more before bedtime with intentions of improving the effectiveness of the skill. Also, she decreases her calorie limit, now only allowing herself 1000 calories per day, while increasing her exercise from 2 to 4 times a week. The cooperation of these improved skills successfully satisfies the purpose (losing weight) in the present. But soon she realizes that she has reached another plateau and considers more modifications, which leads to the emergence of new skills. So, she adjusts the laxative use by increasing her nighttime dosage, now taking 4 in the morning and 4 in the evening to produce the desired effects. She also reduces her calorie intake from 1000 to 800 per day. She continues to exercise 4 times per week, but increases the length of her workout by 1 hour each day. As long as these novel skills cooperate to satisfy the meanings, she maintains them. However, as soon as she realizes that her weight loss has stopped, self-organizing modifications occur because she needs a new skill -- enter experimentation with induced vomiting. While the modified, present skills are continuing to be effective, she begins to purge after her meals. With the introduction of this new skill, the present skills incorporate their functions and meanings within the system to include those served by the new skill. However, as before, she must modify the skills again to improve their effectiveness. Now, she takes 5 laxatives in the morning and 5 in the evening while restricting calorie intake to 500 per day. She now goes to the gym 5 times a week and has become efficient with induced vomiting. Now that the 'big picture' has been presented, a closer examination is warranted to understand more precisely how these skills develop and progress after emergence.

*Laxative Use as a skill:* Taking laxatives in the beginning is known only in a general sense of 'ridding the body of fluid to make it feel/look skinnier'. To satisfy this need, the skill is

practiced through a controlled daily intake. With time and as needed, the skill is modified, incorporating new practices. The person may increase the dosage by a particular amount or rearrange the pill schedule. It might have been realized that taking four pills in the morning was not a good idea since they begin working during the middle of class or at a time when access to a restroom is not possible. Through cognitively analyzing the situation, the person decides to take the pills at nighttime. This decision is based upon experience, since experience has shown that it takes 4 pills about eight or nine hours to become effective; taking them around 11:00 p.m. would mean that they will become active when she/he is home in the morning getting ready for school. Therefore, this alteration allows for immediate access to a bathroom when the pills hit, which in turn increases the satisfactory outcome of the skill. As time progresses, using laxatives becomes very significant as it is a way to monitor precisely what (and how much) sustenance is passing through the body. The capacity to visually recognize what is going through the body is attained as the person learns to pay attention to things such as color and texture. This is informing of the amount of time it takes for specific foods to digest; this will affect future food intake decisions, because (through practice of this skill) the individual knows exactly what types of foods break down the easiest and exit the body the fastest. The ability to stringently monitor internal bodily functions increases awareness of how the body works, and contributes to the formulations of new ways to modify the skill for increased effectiveness.

*Exercise as a skill:* Weight loss is easily monitored through the visual effects of exercise. After emergence, the skill is practiced through utilization on a 'number of days per week' basis. The person may start out exercising 3 times per week with no specific constraints set (i.e. exact number of hours spent at the gym). As time progresses, the skill is modified to be more specific; the number of days increases and an hourly regimen is introduced. Instead of 3 days per week,

the person exercises 4 days a week for 2 hours each time. Through further exploitation of this skill, the ability to see the physical changes in the body may initiate new schemes applicable to the examination of progress. Thus, the skill is adapted to include a 'calorie focus'. The person now exercises 5 days a week for 2 hours each time and becomes aware of the number of calories being burned. Through cognitively breaking down experiences, it is realized that to improve the skill's effectiveness she/he can mathematically supervise calories burned as compared to ingestion per day with a stringent work-out schedule. Now the skill has developed to include exercising 6 days per week for 3 hours each time while burning at least double the number of calories that have been consumed in a day. The person is satisfied with the effectiveness of the skill as it has developed because she/he has acquired the capacity to mathematically assess calorie expenditure as well as visually detect lost pounds. The enforcement of a strict daily x hourly x calorie program is possible and useful because of the developmental progression of exercise as a skill through practice and self-motivated modification.

*Induced vomiting as a skill:* In the beginning, induced vomiting (in a general sense) allows the person to rid the body of consumed food. After emergence, the skill is utilized by forcing the finger down the throat to trigger the gag reflex to cause vomiting. The person must induce by physical action – she/he has to literally force her/himself to throw up. As the skill is practiced, induced vomiting becomes easier as the gag reflex is triggered more efficiently. The person learns exactly how the finger needs to be positioned for the most effective activation of the reflex. Knowledge is acquired about techniques that aid in expelling food from the stomach, such as ways to contract the muscles of the stomach while gagging to produce better results. The skill is improved as the methods of contracting the muscles and gagging is accompanied by the introductory use of mental images and outside resources. It is realized that while using the finger

to invoke the gag reflex along with physically contracting the muscles, presenting unpleasant visual images or nausea provoking thoughts contributes to easier utilization of the skill. Or the person has learned that drinking Ipecac syrup, if all else fails, results in guaranteed induction. With time and development, the skill is easily invoked and the person is capable of inducing vomiting without the use of gagging or gross mental pictures at all; the ability to ‘throw up on command’ has been attained through practice and experimentation with useful additives. This skill is very beneficial to the person in another way because it (like laxative use) allows for the visual monitoring of progress. Through practice, the ability to see exactly what is being drained from the stomach (by again looking for colors and textures) is obtained and perfected. Consider that in precisely this order, a bag of trail mix, a peanut butter and jelly sandwich, a personal pan pizza, a package of white powdered doughnuts followed by a bowl of cereal is consumed. Through employment of this skill, the person is able to tell what (by looking) has been forced out and what remains in the stomach. This allows for intentional action by the individual to induce again in order to drain the remaining food. Practice has also demonstrated which foods allow for easy expelling, in what specific order foods need to be eaten, how much fluid to intake for dilution, and how to monitor what has come out. It has proved a most effective strategy to eat foods that will coat the bottom of the stomach as a way to prevent calorie absorption. Rice is eaten first not only to coat the stomach, but also because it serves as an excellent ‘marker’ food. When rice is all that is left being driven from the body, it indicates that the stomach is nearly empty. Rice is also chosen because even if a small amount is digested, the naturally low-calorie food is not considered a dangerous threat to the body. With rice as the base, the person eats according to experientially attained results, so chocolate is consumed after rice, so that it may have time to liquefy. Heavier foods (breads, pastas, cheese, etc) are consumed next; the

consumption of these foods entails employing scrupulous processing methods (chewing more thoroughly and chasing it with fluid) so that it will surface easily. After the heavy foods, cereal is consumed because the milk will help dilute the contents of the stomach. Finally, water is drunk to fill the stomach completely; practicing the skill has proved that induced vomiting is more easily accomplished when the stomach is full. At this point, only a couple of seconds need pass before all the person has to do is bend over and think “throw up”, and she/he does. By intentionally contracting the stomach muscles, almost all of the food can be released at once. Skill modification has provided the ability to drain stomach in one breath and contraction, without using the finger or imagination. When all that is left is rice, another glass of water is taken in to saturate the remaining grains, making it into a watery substance that is very easy to get rid of. The person has taught her/himself how to make sure all of the rice is ejected by repeating the process of drinking/vomiting until all that is being expelled is stomach acid, which is recognizable to the person by distinctive taste and color. When this happens, satisfaction is attained because the skill has served its purpose, and done so in an extremely effective manner. The skill allows for the control of what is left remaining in and out of the body, which satisfies its meaning.

*Restrictive eating as a skill:* In the beginning, restrictive eating is present in the general form of ‘dieting’. No strict calorie limits are enforced, just a diet consisting of healthier food choices including fruits and vegetables. When minimal weight is lost, the skill is adapted in order to be more effective. Now the diet includes the “no-no list”, which specifies what foods to abstain from totally (i.e. cupcakes and chips). This is immediately followed by increased awareness and attention to calorie content in food. The person begins to intentionally check the number of calories in a given item before eating/drinking it. With these modifications comes

more weight loss, which satisfies the purpose but also instigates further adjustment of the skill for improved results. The knowledge obtained through analyzing calorie content leads to practicing calorie restriction, which involves placing inflexible limits on calorie consumption. Whereas before it included the wise food choices and “no-no list”, now the skill invokes a precise limitation of 1500 calories per day, decreasing over time with skill improvement to only 300 calories per day. The individual learns which foods have the fewest calories but are the most filling and sustaining. Eating schedules develop as a result of restriction; food is consumed at certain times across the day so that excessive hunger or complete starvation is avoided. The person learns through practice to eat 1 or 2 slices of whole-wheat bread (this is variable, because the brands of bread differ in calorie content) right before going to the gym. This provides a small boost of energy and a justification for exercising (i.e. “I ate two slices of Sara Lee Delightful Whole Grain bread, each slice has 45 calories, so that is 90 calories-in addition to the 1000 per day minimum-that must be burned”). As this skill progresses, the person learns ‘life’ and ‘appearance’ sustaining techniques, such as how many calories are required to prevent hair loss or how many are needed to prevent fainting due to electrolyte balance. The advancement of this skill is devastatingly severe in its consequences, yet it is the most rewarding to the person if mastered.

The dynamic, developmental systems approach to understanding cognitive abilities offered by Fischer and Bidell (1998) is useful in attempting to understand the underlying relations among complex processes that lead to the generation of skills. Especially with its focus on explaining and modeling processes of change in complex systems, it is appropriate for the examination of emergent skills employed in an eating disorder. In its beginning stages, the skill has a general meaning and becomes more specific and focused as it progresses. There are

intricately complex analyses occurring psychologically and rationally (at least to the person) that evoke skill modification. When considering the complicated details involved in the emergence, development, and practice of each skill, it is easy to see how self-organized the person must be in order to successfully maintain functioning while aiding the progression of skills. Cited by Lerner (2002), Fischer and Bidell explain it in a way that is supportive of my application of skill theory to eating disorders, as “[s]ystems of activity...must be organized to function properly, to maintain themselves and adapt to variation in useful ways. This organization involves relationships among the biological, psychological, and social systems that contribute to any given activity. In agency people set goals (and regulate their own activities in terms of those goals) with respect to the many systems relationships in which they are embedded” (p. 354). There are many decisions, comparisons, analyses, experiments and practices put into *each* skill; now consider the complexity at hand when *all* the skills are working together toward the same motivation-driven goal. These skills formulate the working systems that comprise the eating disorder, co-operating and functioning, while being intentionally modified for more effective utilization in the fulfillment of purpose.

After reviewing recent literature (Weaver, Wuest, & Ciliska, 2005) on recovery from eating disorders, I have found that due to variation in samples, schemas of recovery, follow-up practices and methodological processes, much of the knowledge of recovery is not generalizable across treatment outcome studies. Study findings present only discrete elements without offering any insight or comprehension of the actual processes (skill development) involved in recovery. Findings from both conventional and analytical research traditions neglect the experience of recovering as a ‘whole’ and reduce it to disconnected components. Because we lack knowledge about the basic social psychological process, there is a need to develop a theoretical

understanding of individual experience within social context. We need universal conformity in definitions and collective theories for recovery. As a result of these shortcomings and restrictions, what remains is an uncertainty about what actually needs to happen for an individual to recover from an eating disorder. The wholistic pattern of macrodevelopment as proposed by Fischer and Bidell efficiently adds to the explanatory framework for an accurate interpretation of emergence in eating disorders, and the concept of formal cause serves as an explanatory utility in the interpretive framework within which to understand the particulars of real-time action-in-context. If Fischer's skill theory (originally implemented for examining cognitive processes) can be applied and utilized in an examination of emerging skills as I have just attempted, could it also be that we may apply the theory to investigate skill development and 'recovery skills' as described by Weaver, Wuest, & Ciliska, (2005)? If we could establish the relationships between meaning transformation and skill development, would that not positively affect prevention and/or management? If so, it would be supportive of the idea that 'recovery' is in fact possible without traditional treatment. Future research is warranted in hopes of gaining insight on the connection (if any) between skill development, Fischer's skill theory, and recovery processes of eating disorders.

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