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How can Developmental Systems Theories Cope with Free Will? The importance of stress-related growth and mindfulness

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Abstract

Science is in the midst of a Kuhnian paradigm shift, from causal, deterministic models to more probabilistic ones that emphasize systems approaches. However, systems theory is still primarily deterministic and does not readily integrate the construct of free will. In the developmental sciences, this shift has been manifesting in relational developmental systems theories (RSDTs) which highlight multi-level analyses, interindividual differences in intraindividual change, and co-action with the context. While agency is an important component in RSDTs, it is unclear how it develops. We argue that free will is a developmental construct, and that the process of the development of free will can arise in two ways: from life-changing encounters with major stressors which result in recognizing limiting influences on one's life and the development of greater self-awareness; and purposive development to increase self-regulation and mindfulness. Through purposive, mindful co-action, the individual and the network can co-evolve in positive ways.

Keywords

ecological theory; free will; self-regulation; mindfulness; stress-related growth

As several have noted in a recent issue of *Research in Human Development*, science in general is in the midst of a radical paradigm shift, from reductionism to transactionalism, from Cartesian dualism to a systems approach, from causal determination to probability (Aldwin, 2014; Antonucci & Webster, 2014). In human development, that new paradigm is often referred to as relational development systems theories (RDSTs; Lerner, Agans, DeSouza, & Hershberg, 2014; Overton, 2014). Drawing upon lifespan theory, Lerner et al. (2012) noted a number of theoretical tenets of this approach, including: integration of levels of organization; mutually influential individual $\longleftrightarrow$ context relations, which are the basic units of analysis; relative (e.g., limited) plasticity; the importance of intraindividual change and diversity; and an emphasis on positive human development (PHD). This shift can be seen in all branches of science, from subatomic physics to sociology and political science.

However, systems theories *per se* are still largely deterministic (Bergner & Ramon, 2013; Witherington, 2014), and so run counter to another trend which is becoming important in the developmental sciences, namely, self-development (Brandstadter, 2006). While current

versions of RDSTs do acknowledge the importance of agency, simply acknowledging agency and even co-action does not address: in the midst of all of these multiple and deterministic factors within developmental systems, how does free will and self-determination develop? To address this dialectic, we will draw upon theories concerning the positive aspects of stress, or stress-related growth (SRG), self-regulation, and mindfulness.

Principles of Systems Theories

Classical and current theories of systems theories have been developing in the past few decades, and earlier theories have emphasizes the more mechanistic and deterministic aspects of systems, while more current versions are more open to self-regulation and self-determination.

Early systems theories

Understanding person-context transactions has been limited by our inability to produce a generalized theory of the environment and to identify systematically the important contextual features which could affect humans (Aldwin & Stokols, 1988; Oishi, 2014). As Lerner et al. (2012) pointed out, understanding integration across systems is a difficult task when for all intents and purposes these are open systems with potentially thousands of variables. Thus, we often end up focusing on a relatively narrow set of contextual variables (e.g., socioeconomic status, social networks) on which there is general agreement about their importance to human well-being.

According to Barabási and Frangos (2002), systems theory is an approach to understanding the interconnections among different elements within ecological contexts or other settings. There are some fairly simple principles which underlie the complexity of systems theory that can also aid in simplifying our understanding of environmental contexts.

First, complex environments can be understood in terms of *nodes and connectors*, whether these nodes are atoms or people, and whether the connectors are subatomic forces or social ties. Second, connections between nodes are not random, but rather reflect *meaningful patterns*. In other words, mathematical models which assume random connections are not tenable, and connections between elements in any system must be meaningful.

Third, there are “*hubs*,” nodes with multiple connections, which can efficiently shorten the distance between any given set of nodes, and thus the density of the network. In other words, some individuals or places have multiple connections, while others have only a few. Fourth, the number of connectors generally can be characterized by *power distributions*, e.g., a Poisson curve or a negative binomial. So, for example, the majority of nodes have only a few links, but there a few have a very large number, the so-called “80-20” rule. For example, roughly 80% of money is earned by 20% of the people, or 80% of publications are generated by 20% of scientists, and so on.

Systems’ theories notions of how change occurs might be informative for developmental scientists. Fifth, *phase transitions* also follow a power law, e.g., the change from relative random water molecules to highly organized ice crystals is a function of the lessened

distance between the atoms, reflecting dense connections between a few nodes. In other words, change occurs when connections become centralized and closer, as when the uncertainty driving Piagetian developmental stages coalesces into an understanding (Acredolo & O'Connor, 1991).

Sixth, any theory must account for *changes* in the number of nodes, which are often *non-linear* and reflect *preferential attachment*, that is, the tendency for nodes to connect to other nodes which have more attachments (so-called “attractors”). As hubs age, they can gradually lose connectors. Seventh, nodes have different “*fitness*” or energy levels, which affect their ability to compete for the new connections. In other words, systems are fluid, with hubs waxing and waning in their number of interconnections, which in turn may well change the shape and even meaning patterns within systems. For example, social movements may arise because a powerful and charismatic leader develops solutions to economic or political crises, which attracts enough followers to that meaning patterns coalesce and can change the sociopolitical systems. See Wallace’s (1966) classic but still highly relevant thesis on how cultural change comes about through shifts in stress and coping patterns, often spear-headed by a small group of individuals, who may be more or less successful in their attempts to help their cultures adapt to change environmental and social milieus.

Finally, networks vary in their level of *robustness*, or resilience, with distributed networks being more resilient than ones in which there are a few powerful hubs. Over-centralization of hubs can make a network more vulnerable to cascading or catastrophic failures. Finally, systems are *self-organizing*, changing in dynamic, non-linear ways.

Thus, classic systems theories follow a series of mathematical principles and are clearly superior to simple reductionistic models in that they account for more complex interactions between elements in a system, and make clear predictions as to how change occurs. Note however, that they are still largely deterministic, self-organization notwithstanding (Witherington, 2014).

Modern systems theories

Mobus and Kalton (2015) have developed a somewhat different approach to the basic principles of systems theory. From their point of view, systems consist of holistic units of networks of relationships. They are processes which are organized into hierarchies, both structural and functional, and interact with other systems. They are dynamic, complex, and evolve over time, but nonetheless have subsystems which promote stability.

The influence of systems theory in sciences such physics and biology is rapidly growing (Greenberg, 2014). Genomics now recognizes that genes are complex, dynamically changing systems that are responsive to environmental influences through epigenetic processes such as methylation. There is growing research on regulatory networks within cells that control metabolism, replication, and cell death, and regulatory networks between cells and organs. Clearly, there is a neural net – more and more research is focused on complex transactions within the brain rather than reducing behavior to one particular brain structure. And biological development follows systems theory tenets (Greenberg). Thus, systems theories are very useful heuristics within which to organize dynamic, evolving systems of networks.

Systems Approaches and Free Will

A potential difficulty with applying systems approaches to human development is the problem of free will. As le Mouél (2014) pointed out, there has been a resurgence of interest in the construct of free will in recent years. But if individuals are strongly influenced by neural networks which seeming act independently of conscious action, or by the behavioral scripts of the nodes to which they are connected, then how can individuals consciously choose courses of action?

The work of Christakis and Fowler (2011) is a good example, in which they show that smoking, weight loss and gain, etc., are influenced not only by our family and friends, but by the broader social networks to which we belong. Indeed, one can conceive of the massive change in the acceptability of smoking in the past three decades in terms of how change in systems is thought to occur – the smoking nodes become fewer and more isolated, the anti-smoking nodes increase dramatically and become tightly connected, until there is a phase shift in the culture concerning the general non-acceptability of smoking. However, it would be incorrect to assume that the influence of these social networks are causal in the sense of simple conditioning paradigms – as anyone knows who has attempted to quit smoking, a great deal of conscious self-regulation is required in this process, although it may certainly be encouraged by attitudes and policies within the network.

To their credit, the current versions of developmental systems theories are careful to incorporate notions of agency and coaction into their theories (e.g., Lerner et al., 2014; Overton, 2014). Individuals actively construct not only the meaning of their contexts, but their transactions with it as well, resulting in the co-construction of themselves and thus their own development. However, the theories do not address how agency or free will develops, although theories of stress-related growth, self-regulation and mindfulness provide clues.

How Does Free Will Develop?

For the past three decades, I have interviewed or surveyed thousands of individuals about very difficult times in their lives, and have become convinced that stress forms a context for development and growth in adulthood (Aldwin, 2007). Severe stress and trauma can result in life-long harm, especially if they result in post-traumatic stress disorder (PTSD), severe depression, or disrupted family bonds. They are often thought to shatter one's assumption networks (e.g., Janoff-Bulman, 2004), which can and often force the individual to re-examine his or her assumption systems. This provides an unparalleled opportunity for self-knowledge, to learn about one's biases, assumptions, and faults. For example, one person I interviewed selected her divorce as the worst thing that happened to her. Scarred by her parents' divorce, she decided that this would never happen to her, and that she would become the perfect wife and thus avoid her parents' fate. Unfortunately, she never thought to ask her husband what he thought the perfect wife would be – or even to consider whether such a thing was even possible – and they divorced. In the interview, she was still struggling with her self-definition, but understood that her ideal self was motivated by fear rather than by a realistic understanding of the give and take in relationships.

Stress can force us to develop new coping skills, resulting in increased mastery. Another woman who I interviewed who also went through a divorce said that at first she believed that she couldn't make it on her own, but went back to school and was able to become self-sufficient, and take care of herself and her children.

Stress and trauma can strengthen social ties, as when communities come together after natural disasters. It can result in increased spirituality and meaning in life (Park, 2010; Tedeschi & Calhoun, 2012). By recognizing what influences us – whether it be family dynamics, social network characteristics, or biases and prejudices in the local culture – one can learn to make choices which are relatively independent of these influences and thus begin the process of developing free will. As Levenson & Crumpler (1996) pointed out, development in adulthood reflects Habermas' (1971) dicta of liberation from biological and social determinism.

However, the development of free will can also reflect purposive development. In adulthood, this is generally seen as involving goal-setting (Brandstädter, Rothermund, Kranz, & Kühn, 2010). However, self-regulation – and, more specifically, the development of mindfulness – can also be seen as a form of purposive development (Levenson & Aldwin, 2013).

In the child development literature, self-regulation depends upon three developmental processes (Eisenberg, Hofer, Sulik, & Spinrad, 2014). First, a child must develop self-awareness by learning to monitor his or her thoughts, feelings, and behaviors. Second, self-regulation requires the ability to consciously direct and sustain attention, whether in the service of problem solving or emotion regulation. Third, a child must learn to monitor his or her own behavior, to become aware of the impact of the behavior others, and modify that behavior in order to achieve goals.

This process sounds a great deal like the development of mindfulness in adulthood, with one important exception. As Roeser & Eccles (2015) noted, mindfulness does involve the direction of sustained attention, but it is the quality of that attention which distinguishes it from simple self-regulation. Kabat-Zinn (1994) emphasized the non-judgmental aspects of that attention, while Bishop et al. (2004) included not only acceptance but also curiosity and openness.

Thus, the development of choice and free will is compatible with a developmental systems approach, as long as one includes notions of awareness of both one's self and of environmental influences. One can choose to affiliate with certain "nodes," or break off contact with ones that are problematic. Further, connections between nodes are not random, but rather reflect *meaningful patterns*, as mentioned earlier. An important part of adult development is generativity and self-transcendence – one can choose to act in ways that benefits others (Levenson & Aldwin, 2013). Thus, one's behavior, especially moral behavior, can affect the meaning of the patterns within and between the nodes. While networks have emergent properties and are self-organizing, individuals can affect the organization of networks, their goals, and their efficiency or resilience. Thus, my wishes are that developmental science empirically examine free will as a developmental phenomenon, and that we get beyond examining outcomes at the individual level, and examine how stress,

coping, and resilience processes affect others in one's social network, the ecological context, and the larger sociocultural milieu (see Aldwin & Igarashi, 2012).

Conclusion

Systems theory approaches are radically change the developmental sciences, and extends beyond calls for multilevel analysis and trajectories of development. It can provide a new way of characterizing the environment, and emphasizes the interconnections between individuals in a systemic whole. However, one must keep in mind the dialectic between being embedded in a social system and its influences on thoughts and actions, and the exercise of choice or free will. Thus, the positive human development central to RDSTs (Lerner et al., 2012) must involves the conscious application of choice, thus affording both co-action and conscious co-evolution.

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References

- Acredolo C, O'Connor J. On the difficulty of detecting cognitive uncertainty. Special issue: Cognitive uncertainty and cognitive development. *Human Development*. 1991; 34:204–223. DOI: 10.1159/000277055
- Aldwin, CM. Stress, coping, and development: An integrative approach. 2nd. New York: Guilford; 2007.
- Aldwin CM. Rethinking developmental science. *Research in Human Development*. 2014; 11:247–254. DOI: 10.1080/15427609.2014.967045 [PubMed: 25598750]
- Aldwin CM, Igarashi H. An ecological model of resilience in late life. *Annual Review of Gerontology/Geriatrics*. 2012; 32:115–130. <http://dx.doi.org/10.1891/0198-8794.32.115>.
- Aldwin, CM., Levenson, MR., Kelly, LL. Lifespan developmental perspectives on stress-related growth. In: Park, CL, Lechner, S, Stanton, A., Antoni, M., editors. *Positive life changes in the context of medical illness*. Washington, DC: APA Press; 2009. p. 87–104.
- Aldwin C, Stokols D. The effects of environmental change on individuals and groups: Some neglected issues in stress research. *Journal of Environmental Psychology*. 1988; 8:57–75. DOI: 10.1016/S0272-4944(88)80023-9
- Antonucci TC, Webster NJ. Rethinking cells to society. *Research in Human Development*. 2014; 11(4):309–322. DOI: 10.1080/15427609.2014.967052 [PubMed: 25642155]
- Barabasi, AL., Frangos, J. *Linked: The new science of networks*. Cambridge, MA: Perseus Publishing; 2002.
- Bergner RM, Ramon A. Some implications of beliefs in altruism, freewill, and nonreductionism. *Journal of Social Psychology*. 2013; 153:598–618. DOI: 10.1080/00224545.2013.798249 [PubMed: 24003585]
- Bishop SR, Lau M, Shapiro S, Carlson L, Anderson ND, Carmody J, Devins G. Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice*. 2004; 11:230–241.
- Brandtstädter, J. Action perspectives on human development. In: Lerner, RM., Damon, W., editors. *Handbook of child psychology (6th ed.): Vol 1, Theoretical models of human development*. Hoboken, NJ: John Wiley & Sons; 2006. p. 516–568.
- Brandtstädter J, Rothermund K, Kranz D, Kühn W. Final decenterations. *European Psychologist*. 2010; 15:152–163. DOI: 10.1027/1016-9040/a000019

- Christakis, NA., Fowler, JH. Connected: The surprising power of our social networks and how they shape our lives – how your friends' friends' friends affect everything you feel, think, and do. Boston: Back Bay Books; 2011.
- Eisenberg, N., Hofer, C., Sulik, MJ., Spinrad, TL. Self-regulation, effortful control, and their socioemotional correlates. In: Gross, JJ., editor. Handbook of emotion regulation. 2nd. New York: Guilford Press; 2014. p. 157-172.
- Greenberg G. How new ideas in physics and biology influence developmental science. *Research in Human Development*. 2014; 11(1):5–21. DOI: 10.1080/15427609.2014.874730
- Habermas, J. Knowledge and human interests. Boston, MA: Beacon Press; 1971.
- Janoff-Bulman R. Posttraumatic growth: Three explanatory models. *Psychological Inquiry*. 2004; 15:30–34.
- Kabat-Zinn, J. Wherever you go, there you are: Mindfulness meditation in everyday life. New York, NY: Hyperion; 1994.
- le Mouél C. Self and the paradox of freewill. *Psychological Perspectives*. 2014; 57:25–49. DOI: 10.1111/j.1758-0854.2009.01008.x
- Lerner, RM., Agans, JP., Arbeit, MR., Chase, PA., Weiner, MB., Schmid, KL., Warren, A., Alberts, E. Resilience and positive youth development: A relational developmental systems model. In: Goldstein, S., Brooks, RB., editors. Handbook of resilience in children. 2nd. New York, NY, US: Springer; 2013. p. 293-308.
- Lerner RM, Agans JP, DeSouza LM, Hershberg RM. Developmental science in 2025: A predictive review. *Research in Human Development*. 2014; 11:255–272. DOI: 10.1080/15427609.2014.967046
- Lerner RM, Weiner MB, Arbeit MR, Chase PA, Agans JP, Schmid KL, Warren AE. Resilience across the life span. *Annual Review of Gerontology and Geriatrics*. 2012; 32(1):275–299. <http://dx.doi.org/10.1891/0198-8794.32.275>.
- Levenson, MR., Aldwin, CM. Mindfulness in psychology and religion. In: Paloutzian, R., Park, CL., editors. Handbook of the Psychology of Religion. 2nd. New York: Guilford; 2013. p. 580-594.
- Levenson MR, Crumpler CA. Three models of adult development. *Human Development*. 1996; 39(3): 135–149. DOI: 10.1159/000278429
- Mobus, GE., Kalton, MC. Principles of systems science. New York: Springer; 2015.
- Oishi S. Socioecological psychology. *Annual Review of Psychology*. 2014; 65:581–609. DOI: 10.1146/annurev-psych-030413-152156
- Overton WF. The process-relational paradigm and relational-developmental-systems metamodel as context. *Research in Human Development*. 2014; 11(4):323–331. DOI: 10.1080/15427609.2014.971549
- Park CL. Making sense of the meaning literature: An integrative review of meaning making and its effects on adjustment to stressful life events. *Psychological Bulletin*. 2010; 136:257–301. DOI: 10.1037/a0018301 [PubMed: 20192563]
- Roeser RW, Eccles JS. Mindfulness and compassion in human development: Introduction to the special section. 2015; 51:1–6.
- Tedeschi, RG., Calhoun, LG. Pathways to personal transformation: Theoretical and empirical developments. In: Wong, PT., editor. The human quest for meaning: Theories, research, and applications. 2nd. New York, NY: Routledge/Taylor & Francis Group; 2012. p. 559-572.
- Wallace, AFC. Religion: An anthropological approach. New York: Random House; 1966.
- Witherington DC. Self-organization and explanatory pluralism: Avoiding the snare of reductionism in developmental science. *Research in Human Development*. 2014; 11:22–31.