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Complexity Under Stress: Integrative Approaches to Overdetermined Vulnerabilities

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Complexity Under Stress: Integrative Approaches to Overdetermined Vulnerabilities

Author Biography

Patricia Andrews Fearon is a member of the IC Thinking Research Group based in the Department of Psychology, University of Cambridge, where she supports the research, design and assessment of IC interventions, which aim to prevent violent extremism, tackle sectarianism, and transform conflict. Patricia is also currently a member of the Emotion and Emotion Regulation Laboratory in the Department of Psychology at the University of California, Berkeley. Patricia holds a master's degree in the study of religions from the University of Oxford where she researched the hermeneutics of religious extremisms.

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Abstract

Over four decades of cognitive complexity research demonstrate that higher integrative complexity (measured by the ability to differentiate and integrate multiple dimensions or perspectives on an issue) predicts more lasting, peaceful solutions to conflict. Interventions that seek to raise integrative complexity offer a promising approach to preventing various forms of intergroup conflict (e.g. sectarianism, violent extremism). However, these contexts can also be extremely stressful, and dominant theory suggests that cognitive complexity *diminishes* in the face of high stress. However, we know that this is not always the case, with some findings demonstrating the opposite pattern: *increases in* complexity under high stress. How is it that some people in the midst of stressful conflict are able to recognize multiple perspectives and solutions, while others become increasingly narrow and rigid in their thinking? The aim of this paper is to integrate these divergent findings through the broader framework of the biopsychosocial model of stress and to explore possible underlying mechanisms such as affect. Implications for intervention will also be discussed.

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Introduction

How is it that some people in the midst of stressful conflict are able to recognize multiple perspectives and solutions, while others become increasingly narrow and rigid in their thinking? One important way to examine these modes of thinking is by measuring cognitive complexity, also known as *integrative complexity* (IC).

Over four decades of cross-cultural IC research reveals that the level of cognitive complexity used in reasoning and decision-making is a robust predictor for preventing conflict and finding lasting, peaceful solutions to conflict.¹ As a measure of cognitive complexity, IC is determined by the level of differentiation, the ability to recognize multiple dimensions or valid perspectives on a given issue, and integration, the ability to recognize the connections or dynamic tensions between those dimensions or perspectives. IC is scored on a scale from one to seven using written or oral data. Accordingly, high cognitive complexity is characterized by broad, flexible thinking that recognizes multiple sides of an issue, uses conditional reasoning, and sees dynamic tensions and connections between dimensions and perspectives. Conversely, low cognitive complexity is characterized by narrow, rigid, black-and-white thinking that does not recognize validity in other viewpoints or entertain doubts.²

¹Peter Suedfeld, "The Cognitive Processing of Politics and Politicians: Archival Studies of Conceptual and Integrative Complexity," *Journal of Personality* 6:78 (December, 2010), available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1467-6494.2010.00666.x/abstract>; Peter Suedfeld, Dana Leighton, and Lucian Conway, "Integrative Complexity and Cognitive Management in International Confrontations: Research and Potential Applications," in Mari Fitzduff and Chris Stout (eds), *The Psychology of Resolving Global Conflicts: From War to Peace* (Westport: Praeger Security International, 2006); Allison Smith, Peter Suedfeld, Lucian G. Conway, and David G. Winter, "The language of violence: distinguishing terrorist from nonterrorist groups by thematic content analysis." *Dynamics Of Asymmetric Conflict* 1:2 (2008): 142, available at: <http://www.tandfonline.com/doi/abs/10.1080/17467580802590449>; Peter Suedfeld, Ryan Cross, and Carson Logan, "Can Thematic Content Analysis Separate the Pyramid of Ideas from the Pyramid of Action? A Comparison Among Different Degrees of Commitment to Violence," in D. Lyle and H. Cabayan (eds.), *Looking Back, Looking Forward: Perspectives on Terrorism and Responses to It* (Washington, D.C.: Strategic Multilayer Assessment Office, Office of the Secretary of Defense, 2013), available at: <http://www.nsiteam.com/social/wp-content/uploads/2016/01/Looking-Back-Looking-Forward.pdf#page=65>; Lucian G. Conway and Katherine R. Conway, "The Terrorist Rhetorical Style and its Consequences for Understanding Terrorist Violence," *Dynamics of Asymmetric Conflict: Pathways Toward Terrorism and Genocide* 4:2 (2011), available at: <http://www.tandfonline.com/doi/abs/10.1080/17467586.2011.627940>.

² Ibid.

Drops in IC from a recent baseline (usually measured in the communications of leaders, decision-makers, or spokespersons) predict conflict and outbursts of violence, while increases in IC predict peaceful outcomes and cooperation.³ We observe a similar pattern in the context of violent extremisms, which can also be interpreted as a form of intergroup conflict expressed in the us versus them structuring of social groups delineated by ideology.⁴ In studies examining a wide range of extremisms, increased acceptance of and commitment to violence is marked by significant decreases in IC. That is, across differing varieties of extremism, such as animal rights, religious, and nationalist extremist groups, each step towards violence on a spectrum from legal activism to violent extremism is marked by significant decreases in IC.⁵ These findings demonstrate the importance of this research not only for cognitive scientists and social psychologists, but also for scholars and practitioners in strategic security and peace building.

Building on this research, the IC Thinking Research Group, based in the Psychology Department at the University of Cambridge, designs interventions that attempt to expand participants' capacities for higher complexity when thinking about and engaging with groups they oppose in order to prevent and transform intergroup conflict in its many forms.⁶ Thus far, intervention outcomes have demonstrated IC gains across diverse cultures and across diverse forms of conflict. One of the advantages of this approach is that the IC measurement itself is not content-specific. In other words, IC is more concerned with the structure of thinking than the content of the thoughts

³ Suedfeld and Conway, "Integrative Complexity and Cognitive Management in International Confrontations."

⁴ Michael A. Hogg, "Uncertainty and Extremism: Identification with High Entitativity Groups Under Conditions of Uncertainty," in Vincent Yzerbyt, Charles M. Judd, and Olivier Corneille (eds.) *The Psychology of Group Perception: Perceived Variability, Entitativity, and Essentialism* (New York: Psychology Press, 2004), available at: <http://www.people.psych.ucsb.edu/sherman/david/hogg.sherman.inpress.jesp.pdf>.

⁵ The word *step* is used cautiously here since this particular analysis was not longitudinal; See note 1 for examples of IC analysis over time. Peter Suedfeld, Ryan Cross, and Carson Logan, "Can Thematic Content Analysis Separate the Pyramid of Ideas from the Pyramid of Action?"

⁶ Jose Liht and Sara Savage, "Preventing Violent Extremism through Value Complexity: Being Muslim Being British," *Journal of Strategic Security* 6:4 (2013): 44-66, available at: www.scholarcommons.usf.edu/cgi/viewcontent.cgi?article=1253&context=jss; Sara Savage, Anjum Khan and Jose Liht, "Preventing Violent Extremism in Kenya through Value Complexity: Assessment of Being Kenyan Being Muslim," *Journal of Strategic Security* 7:3 (2014):1-26, available at: <http://www.scholarcommons.usf.edu/cgi/viewcontent.cgi?article=1361&context=jss>; Eolene Boyd-MacMillan and Sara Savage, "Report on I SEE! Life skills for a changing Scotland course effectiveness empirical evaluation," IC Thinking (Cambridge) Ltd., April 2013, submitted to the Community Safety Unit, Scottish Government.

themselves. In this way, the IC approach does not directly attempt to undermine specific beliefs that participants may hold dear. Rather, the IC Thinking approach seeks to situate these beliefs within a broader perspective. With this wider lens, participants can learn to identify multiple points of view as legitimate and begin to recognize shared values and new possibilities for resolution without abandoning their own values. While exploring the core value tensions that undergird the contentious topics that animate intergroup conflicts, the scaffolding of the intervention guides participants in how to utilize skills that lead to higher complexity when it is needed.⁷

It is important to note that this approach does not absolutize the benefits of using high IC in every situation, but rather seeks to equip participants to use the level of complexity that the situation requires.⁸ For example, if a speeding car is coming towards you, you would not likely benefit from acknowledging a wide range of perspectives and possible solutions before deciding to move out of the way. In some scenarios, a simple, fast decision is most adaptive.⁹ Furthermore, as a measure of cognitive processing based on structure, not content, high IC alone does not necessarily mean higher morality. For example, during the American Civil War, political moderates who were attempting to bring together both sides of the slavery debate demonstrated higher IC than the abolitionists who were uncompromising in their objection to slavery.¹⁰ Additionally, there is evidence that in the context of war (that is, once violence has begun, not necessarily the period leading up to war) generals with higher IC tend to be more successful military strategists, which could hardly be described as a reduction in violence.¹¹ Therefore, using high

⁷ Ibid.

⁸ Peter Suedfeld, "Cognitive Managers and Their Critics," *Political Psychology* 3:13 (1992): 435-453, available at: <http://www.jstor.org/stable/3791607>; Peter Suedfeld and Stanley Coren, "Cognitive correlates of conceptual complexity," *Personality and Individual Differences* 11:13 (1992), available at:

<http://www.sciencedirect.com/science/article/pii/019188699290255N>.

⁹ Peter Suedfeld, "Authoritarian Thinking, Groupthink, and Decision-Making Under Stress: Are Simple Decisions Always Worse?" Paper presented at the Annual Meeting of the American Psychological Association, Washington, D.C., August 22-26, 1986, available at: <http://files.eric.ed.gov/fulltext/ED282809.pdf>.

¹⁰ Philip Tetlock, David Armor, and Randall Peterson, "The Slavery Debate in Antebellum America: Cognitive Style, Value Conflict, and the Limits of Compromise," *Journal of Personality and Social Psychology* 66:1 (1994): 115-126, available at: <http://psycnet.apa.org/journals/psp/66/1/115.pdf>.

¹¹ Peter Suedfeld, Raymond Corteen, and Carrol McCormick, "The Role of Integrative Complexity in Military Leadership: Robert E. Lee and His Opponents" *Journal of Applied Social Psychology* 6:16 (1986): 498-507, available at <http://www.onlinelibrary.wiley.com/doi/10.1111/j.1559-1816.1986.tb01155.x/abstract>.

IC as an important resource for preventing or transforming conflict requires not only cognitive empathy, measured by IC, but also emotional empathy, which is related to empathic concern or compassion.¹² Together, these cognitive and emotional skills constitute the resources and motivation for preventing and reducing violent conflict.

For this reason, IC Thinking interventions aim to build both the cognitive and emotional empathy needed to navigate conflict. Published findings from interventions reveal that participants demonstrated significant increases in both IC and in the values of benevolence (value for being helpful, honest, forgiving, and loyal whatever the cost) and universalism (value for equality, social justice, wisdom, tolerance, unity with nature).¹³ By developing the capacity for higher cognitive complexity and compassion, we expand the ability to respond adequately and aptly to complex conflicts, be they intraindividual, intergroup, or international.

However, we must also remember that these cognitive and emotional skills do not operate in a vacuum. In the context of conflict, especially when the stakes are the highest, stress is also likely to be at its highest; and, according to the *disruptive stress* hypothesis, complexity plummets in the face of high stress.¹⁴ Happily, we know that this is not always the case. Although the disruptive stress hypothesis remains the dominant theory relating stress and complexity, tests of this hypothesis yield divergent results, with many studies also observing the opposite pattern: complexity continuing to increase even in high stress situations.¹⁵

¹² Patricia Oswald, "The Effects of Cognitive and Affective Perspective Taking on Empathic Concern and Altruistic Helping," *The Journal of Social Psychology* 5:135 (1996): 613-623, available at: <http://www.ncbi.nlm.nih.gov/pubmed/8942318>.

¹³ Liht and Savage, "Preventing Violent Extremism through Value Complexity."

¹⁴ Charles Hermann and Linda Brady, "Alternative Models of International Crisis Behavior" in Charles Hermann (ed.) *International Crisis: Insights From Behavioral Research*, New York: Free Press, 1972, available at: <http://voxprofessor.org/cfh/hermann-pubs/Hermann-Alternative%20Models%20of%20International%20Crisis%20Behavior.pdf>;

Peter Suedfeld, "The Cognitive Processing of Politics and Politicians: Archival Studies of Conceptual and Integrative Complexity," *Journal of Personality* 78:6 (December 2010), available at: <https://www.ncbi.nlm.nih.gov/pubmed/21039528>.

¹⁵ Ariel Levi and Philip Tetlock, "A Cognitive Analysis of Japan's 1941 Decision for War" *Journal of Conflict Resolution* 2:24 (1980): 195-211, available at: <http://faculty.haas.berkeley.edu/tetlock/vita/Philip%20Tetlock/Phil%20Tetlock/1977-1983/1980%20Cognitive%20Analysis%20of%20Japans%201941%20Decision%20For%20War.pdf>; Michael Wallace and Peter Suedfeld, "Leadership performance in crisis: The longevity-complexity link," *International Studies Quarterly* 32 (1988): 439-451, available at: https://www.jstor.org/stable/2600592?seq=1#page_scan_tab_contents; Peter Suedfeld and Susan Bluck, "Changes in Integrative Complexity Accompanying

A clearer understanding of the relationship between stress and cognitive complexity will be crucial to our understanding of intergroup conflict and to the success of strategic interventions. The purpose of this article is to explore how and why stress can disrupt or catalyze complexity and how we might promote the latter. We aim to do this by establishing a broader theoretical framework for understanding the relationship between stress and cognitive complexity that can integrate divergent findings, point to possible mechanisms, and to offer insights for practitioners. To do this, we will first examine the long-standing theory relating stress and complexity, the disruptive stress hypothesis.

Toward an Integrative Model of Stress and Complexity

The Disruptive Stress Hypothesis

The disruptive stress hypothesis posits that high levels of stress will disrupt cognitive complexity—adopting a pattern analogous to the Yerkes-Dodson curve, the inverted U description of performance rising from low to moderate levels of stress followed by declining performance with increasingly high levels of stress.¹⁶ Originally proposed as an explanation for defective decision-making by leadership in times of crisis, the disruptive stress hypothesis has been widely adopted in the integrative complexity literature as the dominant theory relating stress and complexity.¹⁷ While this hypothesis has strong support in the IC literature, findings also repeatedly point to an alternative pattern that casts doubt on the generalizability of the hypothesis.¹⁸ That is, studies also repeatedly find cases in which complexity continues to rise in the face of extreme stress.¹⁹

Perhaps the most striking example of this pattern is the study of Soviet Foreign Minister Andrei Gromyko, whose baseline complexity was similar to his peers in times of low stress, but consistently demonstrated heightened

Significant Life Events: Historical Evidence,” *Journal of Personality and Social Psychology* 1:64 (1993): 124-130, available at:

<http://psycnet.apa.org/index.cfm?fa=buy.optionToBuy&id=1993-21556-001>.

¹⁶ Robert Yerkes and John Dodson, “The relation of strength of stimulus to rapidity of habit-formation,” *Journal of Comparative Neurology and Psychology* 18 (1908): 459-482, available at: <http://onlinelibrary.wiley.com/doi/10.1002/cne.920180503/abstract>.

¹⁷ Hermann and Brady, “Alternative Models of International Crisis Behavior.”

¹⁸ Suedfeld, “The Cognitive Processing of Politics and Politicians.”

¹⁹ Please note that in these examples, it is the relationship between complexity and stress that is being examined, not necessarily the relationship between complexity and particular outcomes. See note 1.

levels of complexity in times of crisis.²⁰ This study also found a similar pattern in a number of other foreign ministers who had distinctly long tenures in office.²¹ In the case of stressors that are more personal in nature, Suedfeld and colleagues measured the integrative complexity of participants describing conflict scenarios with varying levels of emotional involvement associated with stress. Contrary to what the disruptive stress hypothesis predicted, higher emotional involvement correlated positively with higher integrative complexity.²² This study suggests that emotional involvement may help motivate deeper, broader thinking about the scenario. Another study that examined IC before, during and after significant life events in the writings of non-policy-making public figures found a similar pattern: complexity rising with stress and returning to baseline when the crisis resolves.²³

Disruptive stress is defined, somewhat tautologically, as the point at which stress causes a decline in cognitive complexity. So, we should not deem the disruptive stress hypothesis to be false, but perhaps, incomplete.²⁴ By this definition, any stress, from a war to a common cold could be considered disruptive stress if it is associated with a drop in complexity. Therefore, we need a broader framework to account for the divergence of observed outcomes in the stress and complexity literature and to provide a clearer understanding of the mechanisms that might produce these outcomes.

Beyond Stimulus-Response Approaches

The disruptive stress hypothesis employs a *stimulus-response* approach to understanding stress; it postulates that a certain stimulus (a stressor such as war) will bring about a certain response (diminished complexity). As noted above, this would imply that people might be unable to think in complex ways at the very times when it is needed most. The primary advantage of these approaches relates to research methods, how we access and assess the relationship between stress and cognitive complexity in the real world: the

²⁰ Wallace and Suedfeld, "Leadership performance in crisis: The longevity-complexity link."

²¹ Ibid.

²² Peter Suedfeld, Susan Bluck, and Elizabeth Ballard, "The Effects of Emotional Involvement and Psychological Distance on Integrative Complexity," *Journal of Applied Social Psychology* 5:24 (1994): 443-452, available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1559-1816.1994.tb00592.x/abstract>.

²³ Suedfeld and Bluck, "Changes in Integrative Complexity Accompanying Significant Life Events."

²⁴ Suedfeld, "The Cognitive Processing of Politics and Politicians."

relatively objective/observable nature of the stimulus or environment stressor, such as a war, and of the response, measured in IC. As we would expect, there is high consensus that environmental stimuli such as an international crisis or losing a spouse are extremely stressful. Indeed, one of the earliest methods for measuring stress, the Social Readjustment Rating Scale, offers some level of objectivity by measuring stress based on the number of significant life events one is experiencing.²⁵ Modified versions of these scales are still widely used. In the case of the IC literature, using archival data from policy-makers during a specific crisis offers a reasonable control of the stimulus; for example, comparing colleagues facing the same crisis. Archival data also offers high ecological validity since these situations were playing out in real, high-stakes situations. However, the initial research advantages of these approaches, in the long term, have not compensated for what remains unexplained. As illustrated in the aforementioned examples, we can observe *different responses* from the *same stimuli* (a single stressor can lead to both increased and decreased cognitive complexity for different individuals), but we can also observe the *same response* from *different stimuli* (increased complexity during varied emotional scenarios). Therefore, disruptive stress is overdetermined, making it almost impossible to predict if a particular stressor will disrupt or catalyze complexity for an individual. Though we are not the first to suggest that *psychological events* rather than *historical events* may better predict disruptive stress, this has yet to be thoroughly explored.²⁶ Therefore, we must look beyond simple stimulus-response approaches and consider not only the environment and the person's response, but also the person-environment relationship shaped by *appraisals*. Fortunately, recent models of the stress response offer just such a framework.

From Appraisal Theory to the Biopsychosocial Model of Challenge and Threat

In his foundational development of appraisal theory, Richard Lazarus and colleagues approach stress as a relationship between the environmental

²⁵ Thomas Holmes and Richard Rahe, "The social readjustment rating scale," *Journal of Psychosomatic Research* 11 (1967): 213-218, available at: [http://psycnet.apa.org/doi/10.1016/0022-3999\(67\)90010-4](http://psycnet.apa.org/doi/10.1016/0022-3999(67)90010-4).

²⁶ Peter Suedfeld, Raymond Corteen, and Carroll McCormick, "The Role of Integrative Complexity in Military Leadership: Robert E. Lee and His Opponents," *Journal of Applied Social Psychology* 6:16 (September, 1986): 498-507, available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1559-1816.1986.tb01155.x/abstract>.

demands and one's goals and resources *mediated through appraisals*.²⁷ Lazarus posited that appraisal, one's subjective evaluation or cognitive construal of the situation, is the key to understanding stress. One's appraisal of a situation will determine whether and what kind of stress response ensues. According to Lazarus, appraisals determine the relevance of the stimulus to the self (values, motivations, goals); essentially, *do I have a goal or core value at stake?*²⁸ If a person appraises the situation as irrelevant or benign to one's goals, there is no stress response. In contrast, when a goal or value is judged to be at stake, one must also appraise the meaning of the situation (realized loss, possible growth or possible harm), and one's *resources* to meet the *demands*.²⁹ This theory formed the foundations of the more recent biopsychosocial (BPS) model of challenge and threat, which has established that different cognitive appraisals can lead to *different stress responses* with distinct cognitive and affective profiles.³⁰

According to the BPS model, in a motivated performance situation (appraisal that something is at stake, i.e. a stressful situation), appraisals of the situation and one's resources can result in two distinct stress responses: challenge or threat.³¹ Simply stated, when one appraises a situation as having demands that exceed resources, a threat response ensues. In other words, threat is the result of an appraisal of possible future harm and/or low self-efficacy, that is, doubt in one's own ability to manage the threat. If one appraises their resources as nearly equal or greater to the appraisal of what the situation demands (i.e. possible growth and/or high self-efficacy) a challenge response ensues. These appraisals can be conscious, outside of conscious awareness, and reciprocally determined.³² We propose that the divergent responses to stress observed in the IC literature may be better understood through the lens

²⁷ Lazarus, Richard S., and Susan Folkman, *Stress, Appraisal and Coping* (New York: Springer Publishing Company, Inc., 1984) 22-38.

²⁸ *Ibid.*

²⁹ While these were originally labeled 'primary' and 'secondary' appraisals, these labels are now sometimes avoided to prevent confusion that one appraisal necessarily precedes the other in importance or temporal sequence, when they are in fact reciprocally determined, and also to avoid confusion with Lazarus's original conception of primary and secondary appraisals, which differs somewhat from the BPS model.

³⁰ For a review see: Mark Seery, "Challenge or threat? Cardiovascular indexes of resilience and vulnerability to potential stress in humans," *Neuroscience and Behavioral Reviews* 35 (2011) 1603-1610, available at: <https://www.ncbi.nlm.nih.gov/pubmed/21396399>.

³¹ Jim Blascovich and Wendy Berry Mendes, "Challenge and threat appraisals: The role of affective cues," in J. Forgas (Ed.), *Feeling and thinking: The role of affect in social cognition* (Paris: Cambridge University Press, 2000) 59 – 82, available at: http://wendyberymendes.com/cms/uploads/challenge_threat.pdf.

³² *Ibid.*

of the challenge and threat stress responses, with disruptive stress representing the latter.

It is important to note that the the disruptive stress hypothesis also employs the language of *resources*. While most invocations of the disruptive stress hypothesis use the simplified rule that stress lowers complexity, more nuanced discussions of the hypothesis suggest that complexity will climb during low to moderate levels of stress as the stress enlists more cognitive resources, but will begin sloping downward in the inverted U pattern when cognitive resources are “depleted.”³³ This is well aligned with the framework discussed here; the important distinction to add is that it is the *appraisal* of resources and demands (and that resources and demands are not strictly cognitive, but could also be emotional or material in nature), rather than the stressors or resources in and of themselves that will determine the response under stress. Of course, it makes sense that the disruptive stress hypothesis succeeds so well in describing the majority of the data because the majority of people approaching or experiencing a crisis do appraise the situation as a threat. Therefore, the disruptive stress hypothesis is accurate insofar as it describes a threat stress response, but fails to account adequately for the challenge response under stress.

However, it is impossible to know from archival sources whether these changes in complexity reflected moment-to-moment changes in appraisals of demands and resources. Therefore, let us turn to the way in which the study of challenge and threat has burgeoned into a robust literature that can help us understand *how* appraisals might lead to increases or decreases in complexity. Building on Lazarus's appraisal theory, the vast literature on the biopsychosocial (BPS) model of challenge and threat has further illuminated the cognitive, affective, and physiological dimensions of these distinct stress responses and their antecedents.

While a complete review of the findings of the BPS model lies well beyond the scope of this article, here we begin to explore some of the ways this framework can help account for the divergent findings in the integrative complexity literature by examining the cognitive and affective processes of challenge, threat, and complexity. According to the BPS model, a challenge

³³ Karen Guttieri, Michael Wallace, and Peter Suedfeld, “The Integrative Complexity of American Decision Makers in the Cuban Missile Crisis,” *The Journal of Conflict Resolution* 4:39 (December, 1995): 595-621, available at: <https://www.jstor.org/stable/174379>.

response (an appraisal of resources that nearly meets or exceeds demands) is associated with improved cognitive performance, willingness to consider other viewpoints, and greater positive affect. Conversely, a threat response is associated with diminished cognitive performance, rigidity, resistance to opposing viewpoints, and negative affect.³⁴

These distinct stress responses also elicit distinct physiological patterns, which help to illustrate further the multifarious, non-singular, nature of the stress response. Physiologically, a challenge response enlists the SAM (sympathetic adrenal medullary) axis to increase heart rate and cardiac output while simultaneously lowering peripheral resistance in the blood vessels so that blood pressure remains stable or lowers, enabling maximum blood flow to the brain and muscles to engage in the challenge.³⁵ A threat response activates both the SAM and the HPA (hypothalamic-pituitary-adrenal) axes, resulting in the elevation of cortisol in the blood.³⁶ Heart rate is also elevated during threat, along with *increased* peripheral resistance, which leads to higher blood pressure.³⁷

Given the physiological impact of stress on health, especially as it relates to cardiac activity, one could easily make inferences about the benefits of a challenge response for one's physical health. However, that discussion is beyond the scope of this article. Here, we discuss physiological responses to stress to delineate further between stress responses and to assess whether these patterns might align with what we know about the impact of stress on cognition. For example, in a laboratory examination of the disruptive stress

³⁴ Seery, "Challenge or threat?"; Jim Blascovich, "Challenge and threat" in A.J. Elliot (Ed.), *Handbook of Approach and Avoidance Motivation* (New York: Psychology Press, New York, 2008.) pp. 431–44; Natalie Skinner and Neil Brewer, "Adaptive Approaches to Competition: Challenge Appraisals and Positive Emotion" *Journal of Sport & Exercise Psychology* 26 (2004): 283-305, available at:

<http://journals.humankinetics.com/doi/abs/10.1123/jsep.26.2.283>; Marc Jones, Carla Meijen, Paul McCarthy, and David Sheffield, "A theory of challenge and threat states in athletes," *International Review of Sport and Exercise Psychology* 2:2 (2009): 161-180, available at:

<https://kar.kent.ac.uk/26252/1/A%20Theory%20of%20Challenge%20and%20Threat%20States%20in%20Athletes-Not%20for%20Review.pdf>; Frank de Wit, Daan Scheepers, and Karen Jehn, "Cardiovascular reactivity and resistance to opposing viewpoints during intragroup conflict," *Psychophysiology* 49 (2012): 1523-1531, available at:

<http://www.ncbi.nlm.nih.gov/pubmed/22971071>.

³⁵ Liht and Savage, "Preventing Violent Extremism through Value Complexity."

³⁶ Jim Blascovich and Wendy Berry Mendes, "Social Psychophysiology and Embodiment," in Susan T. Fiske, Daniel T. Gilbert, and Gardner Lindzey (eds.), *Handbook of Social Psychology* (New Jersey: John Wiley & Sons, Inc., 2010): 194-227.

³⁷ Ibid.

hypothesis, Saslow and colleagues find that higher cortisol reactivity is associated with lower cognitive complexity in speech tasks, a finding that would suggest a link between HPA-axis reactivity, which is associated with a threat response, and diminished complexity.³⁸ It is also interesting to note that while the effect of HPA-axis activation on cognitive performance appears to follow the Yerkes-Dodson inverted U curve, the pattern adopted by the disruptive stress hypothesis, the SAM axis, associated with challenge response, does not. This differential response offers additional support to the hypothesis that disruptive stress may be specifically related to a threat response, but not a challenge response.³⁹

Recall that high integrative complexity, the ability to recognize multiple dimensions and perspectives and find links among them, requires a cognitive style that is both broad and flexible.⁴⁰ Conversely, lower complexity is associated with a more rigid, narrow cognitive style.⁴¹ Therefore, we see that the differential influence of a challenge versus a threat response aligns with differential cognitive styles of high versus low integrative complexity, respectively, lending further support to the hypothesis linking disruptive stress to the threat response.⁴² Now, if we grant that divergent responses to stress, in terms of cognitive complexity, can be understood as differences in cognition during a challenge or threat response, then what is the mechanism underlying these differences? That is, what is it about a challenge or threat response that leads to either broader or narrower cognitive processing? Given that stress is an essentially emotional experience, and considering the interdependence of emotion and cognition, and we will examine one possible mechanism: positive emotion.

³⁸ Laura Saslow, Shannon McCoy, Ilmo Van Der Lowe, Brandon Cosley, Arbi Vartan, Christopher Oveis, Dacher Keltner, Judith Moskowitz, and Elissa Epel “Speaking under pressure: Low linguistic complexity is linked to high physiological and emotional stress reactivity,” *Psychophysiology* 51 (2014): 257-266, available at: <https://www.ncbi.nlm.nih.gov/pubmed/24354732>.

³⁹ Blasovich and Mendes, “Social Psychophysiology and Embodiment,” p. 205.

⁴⁰ Peter Suedfeld, “Cognitive Managers and Their Critics,” *Political Psychology* 3:13 (1992), 435-453; Peter Suedfeld and Stanley Coren, “Cognitive correlates of conceptual complexity.”

⁴¹ Ibid.

⁴² Darja Gutnick, Frank Walter, Bernard Nijstad, and Carsten De Dreu, “Creative performance under pressure: An integrative conceptual framework,” *Organizational Psychology Review* 2:3 (2012), 189-20, available at: <https://www.ncbi.nlm.nih.gov/pubmed/229710717>; De Wit et al., “Cardiovascular reactivity and resistance to opposing viewpoints during intragroup conflict.”

Affect, Stress, and Cognitive Complexity

Studies that have measured affect during challenge and threat states have found that while negative emotions related to stress are present during a threat response, during a challenge response, both positive and negative emotions are present.⁴³ This does not necessarily mean that someone is experiencing hedonic happiness during a challenge state. There is a wide range of positive emotions that one might experience in the midst of stress: interest, hope, inspiration, alertness, courage, gratitude, patience, discovery, compassion, among others.

From decades of research by Isen and colleagues, we also know that positive emotion tends to elicit “broad, flexible cognitive organization and ability to integrate diverse material,” which is precisely the cognitive style associated with high integrative complexity.⁴⁴ Subjects experiencing positive emotion also tend to show cognitive styles that are more creative, efficient, and open to new information and perspectives.

As Isen notes:

“There is reason to believe that, even in a potentially hostile situation, positive affect facilitates cognitive flexibility, the ability to switch between perspectives and see things in multiple ways and come up with viable solutions, and the ability to cope with potential problems and avoid conflict.”⁴⁵

Following this research, Fredrickson's broaden and build hypothesis has demonstrated that positive emotions broaden cognition and help build resources by expanding thought-action repertoires:

“Positive emotions promote discovery of novel and creative actions, ideas and social bonds, which in turn build that individual's personal

⁴³ Skinner and Brewer, “Adaptive Approaches to Competition: Challenge Appraisals and Positive Emotion”; Jones et al., “A theory of challenge and threat states in athletes.”

⁴⁴ Alice Isen, “The influence of positive and negative affect on cognitive organization: some implications for development,” in (ed. N. Setin, B. Leventhal, and T. Trabasso) *Psychological and biological approaches to emotion* (Hillsdale, New Jersey: Erlbaum, 75-94. (89).

⁴⁵ Alice Isen, “An Influence of Positive Affect on Decision Making in Complex Situations: Theoretical Issues with Practical Implications,” *Journal of Consumer Psychology* 2:11, (2001) 75-85, available at: http://www.psychologie.uni-heidelberg.de/ae/allg/mitarb/ms/Isen_2001.pdf.

resources; ranging from physical and intellectual resources, to social and psychological resources.”⁴⁶

Therefore, there is strong support for the hypothesis that the positive emotion experienced during a challenge stress response might be responsible for one's ability to demonstrate the broader, more flexible cognitive style associated with higher complexity under stress. Furthermore, one would expect a challenge appraisal to be reciprocally linked with positive emotion since positive emotion helps broaden the perception (and appraisal) of resources; and, both building and perceiving more resources may in turn engender more positive emotion. This upward spiral contrasts with the downward spiral of negative emotion: negative emotion leading to narrower attention, fewer perceived options, increased threat vigilance, and increased appraisals of threat, engendering still more negative emotion.⁴⁷

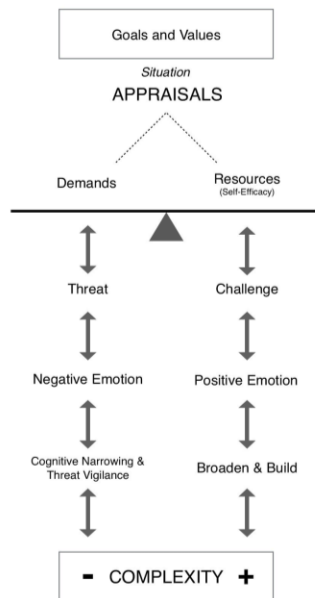


Fig. 1 Process model of stress, appraisals, affect, and cognitive complexity.

In this process model (Figure 1) we see how appraisals of demands and resources in the situation, and the weight accorded to each, determine the type of stress response (challenge or threat) and affective responses that ensue, and ultimately influence cognitive complexity. This process model also uses bidirectional arrows to indicate the reciprocal nature of these relationships.

So while we have evidence linking the cognitive

⁴⁶ Barbara Fredrickson, “The broaden-and-build theory of positive emotions,” *Philosophical Transactions of the Royal Society of London* 359 (2004): 1367-1377, available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1693418>.

⁴⁷ Eric Garland, Barbara Fredrickson, Ann M. Kring, David P. Johnson, Piper S. Meyer, and David L. Penn, “Upward spirals of positive emotions counter downward spirals of negativity: Insights from the broaden-and-build theory and affective neuroscience on the treatment of emotion dysfunctions and deficits in psychopathology,” *Clinical Psychology Review* 7:30, (November, 2010) 849-864, available at: <https://www.ncbi.nlm.nih.gov/pubmed/20363063>.

styles of positive emotion and higher cognitive complexity, is there any evidence that directly links complexity and affect under stress? In the aforementioned laboratory study linking cortisol reactivity to lower complexity under stress, Saslow and colleagues also examined the role of affect. Using the Trier Social Stress Test paradigm (the gold standard for laboratory inducements of stress), researchers collected self-report measures of both state and trait measures of positive emotion. In other words, participants reported their levels of positive emotions in response to a current stress task, and reported on their more general dispositional tendency to increase positive emotion during stress and to see stress as an opportunity for growth. They found that each of these measures for higher positive emotion under stress correlated positively and significantly with higher complexity.⁴⁸ However, perhaps it is easier to find some positive emotion in a laboratory speech task when the stakes are low than in “real world” situations. Is there any evidence that positive emotion can promote complexity under stress in times of real crisis?

Although a great deal of research has examined the benefits of positive emotion for general resilience and psychological health during stress, scant empirical work has directly examined the relationship between emotion and integrative complexity during real world stress. While more research is needed to this end, one study by Jhangiani and Suedfeld offers some helpful insight. Analyzing transcripts of the live coverage of the September 11, 2001 attacks on the World Trade Center, Jhangiani and Suedfeld measured the complexity of the newscasters' speech before, during and after the attacks. They also coded the speech for affect (operationalized as the ratio of negative to positive words used). They found that changes in complexity mirrored changes in affect, such that increases in the negative emotions (relative to positive emotions) coincided with drops in complexity, and decreases in negative emotion (relative to positive emotions) coincided with increased complexity.⁴⁹ Using the theoretical framework of challenge and threat not only provides a clearer understanding of the possible mechanisms, such as affect, that lead to divergent outcomes under stress, it also helps us identify key sites open to intervention and effective methods for promoting complexity under stress when it is needed.

⁴⁸ Saslow, “Speaking under pressure.”

⁴⁹ Rajiv Jhangiani and Peter Suedfeld, “Integrative Complexity and Emotional Positivity during a Terrorist Attack,” In *Emotional and Cognitive Responses to Terrorism and Violence*, 28th Annual Meeting of the International Society of Political Psychology, Toronto, Canada, July, 2005, available at: <http://homes.chass.utoronto.ca/~josephf/Jhangiani&SuedfeldISPP05.pdf>.

Implications for Intervention

Understanding how and why individuals respond to stress with increased or decreased complexity—be they national leaders and key decision-makers in times of international crisis or average citizens—bears critical implications for strategic security. We must not only understand how we can raise integrative complexity, but also how we can equip individuals to maintain this complexity in the face of unavoidable stress (as in the context of conflict or when being targeted for recruitment by violent extremists, or living in a climate of ongoing threat of violence or discrimination). Based on the model proposed here, what lessons can we draw from existing research that can help us design more effective intervention strategies? While countless possibilities exist, we will very briefly discuss a few strategies empirically shown to facilitate a challenge instead of a threat response, increase positive emotion under stress, and access sites that are open and responsive to intervention.

If positive emotion mediates the relationship between increased or decreased complexity under stress, then the pragmatic question is how do we increase positive emotions during stress? To answer this question, we look to the recently burgeoning literature on emotion regulation. While a complete review of this literature is beyond the scope of this article, we will briefly discuss one of the most studied and championed emotion regulation strategies: *cognitive reappraisal*.

Cognitive Reappraisal

Cognitive reappraisal is an emotion regulation technique in which one attempts to reframe, or change the meaning of a situation in order to change its emotional impact.⁵⁰ While much of the research has focused on how one can use cognitive reappraisal to mitigate negative emotions, cognitive reappraisal can also be used to increase positive emotions in the face of stress, sometimes called *positive reappraisal*.⁵¹ Research in this area has demonstrated that simply instructing an individual to employ this technique can lead to self-generated positive emotions.⁵² In a recent study, McCrae and Mauss suggest that positive reappraisal, the ability to generate positive

⁵⁰ James Gross, “Antecedent and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology,” *Journal of Personality and Social Psychology* 74 (1998): 224–237.

⁵¹ Kateri McRae and Iris Mauss, “Increasing positive emotion in negative contexts: Emotional consequences, neural correlates, and implications for resilience,” In press (2016).

⁵² *Ibid.*

emotions, may have unique benefits precisely because it increases positive emotion without necessarily decreasing negative emotions that may have adaptive motivational benefits.⁵³ In a laboratory study comparing emotional regulation strategies, Shiota and Levenson found that participants instructed to use positive reappraisal demonstrated greater positive to negative affect ratio and physiological responses associated with a challenge response, increased heart rate coupled with reduced blood pressure.⁵⁴ Furthermore, in the aforementioned laboratory study of complexity under stress, benefit-finding, a type of positive reappraisal was correlated positively and significantly with higher complexity.⁵⁵

As an approach that incorporates cognitive-behavioral theory and methods, IC interventions include a wide variety of cognitive reappraisal processes. Some are explicit emotion-regulation techniques, for example how to use humor to diffuse tension, while others regulate emotion more indirectly, as in the case of reappraising outgroups as less threatening, but not necessarily because of an emotional goal. These interventions aim for participants to cultivate skills like cognitive reappraisal through self-direction and experience, rather than through explicit instruction. One way this can be achieved is through fostering metacognitive and meta-affective awareness. Some research has suggested that mindfulness training, which strengthens metacognitive awareness, fosters more adaptive coping because it strengthens positive reappraisal habits.⁵⁶

Another intervention strategy, known as *implementation intention*, attempts to *automatize* goal activation by establishing a mental link between the situation and the intended emotion regulation strategy. For example, one could form an association between the emotional state of feeling threatened and one's emotion regulation goal (e.g. If I start to feel threatened during the negotiation, I will think about the benefits of reaching a deal). Studies using fMRI technology to examine the neural correlates of using implementation intentions to promote emotion regulation found that the initiation of emotion regulation was more efficient and less effortful than if simply instructed to use

⁵³ McRae and Mauss, "Increasing positive emotion in negative contexts"

⁵⁴ Michelle Shiota and Robert Levenson, "Turn Down the Volume or Change the Channel?: Emotional Effects of Detached Versus Positive Reappraisal," *Journal of Personality and Social Psychology* 3:103 (2012): 416-429, available at: <https://www.ncbi.nlm.nih.gov/pubmed/22746676>.

⁵⁵ Saslow, "Speaking under pressure."

⁵⁶ Eric Garland, Susan Gaylord, and Jongbae Park, "The Role of Mindfulness in Positive Reappraisal," *Explore* 5:1 (2009), 37-44, available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2719560/>.

an emotion regulation technique without using implementation intentions.⁵⁷ In an intervention context, utilizing role-play to simulate the experience of conflict can help establish a situational cue to pause and activate the goal of becoming aware of thoughts and feelings. For example, one could use role-play to practice and further crystallize the implementation intention (e.g. When I feel myself starting to get worked-up, I stop, take a deep, slow breath, and I think about where the other person might be coming from).⁵⁸ Another way reappraisal might enhance positive emotions during stress is by reappraising the stress itself through a shift in *stress mindset*.

Stress Mindset

Stress mindset is the basic belief one holds about the nature of stress itself; that is, whether one believes that stress is essentially enhancing or debilitating.⁵⁹ While appraisals are situation-specific evaluations, mindsets are basic beliefs that have the power to shape both goals and appraisals:

“A mindset is defined as mental frame or lens that selectively organizes and encodes information, thereby orienting an individual toward a unique way of understanding an experience and guiding one toward corresponding actions and responses.”⁶⁰

Research suggests that adopting a stress is enhancing mindset can influence the way one experiences stress and may support complex thinking in a variety of ways. As a mindset, the basic belief that stress is enhancing or that stress is debilitating can shape appraisals both within or without conscious appraisal. Following the BPS model, one's appraisal of the ratio of resources to demands determines the stress response, challenge or threat. Therefore, one can promote a challenge response by appraising lower demands, higher resources,

⁵⁷ Glyn Hallam, Thomas Webb, Paschal Sheeran, Eleanor Miles, Iain Wilkinson, Michael Hunter, et al., “The Neural Correlates of Emotion Regulation by Implementation Intentions,” *PLoS ONE*, 10:3, 2015. For a review, see: Peter Gollwitzer and Paschal Sheeran “Implementation Intentions and Goal Achievement: A Meta-Analysis of Effects and Processes,” *Advances in Experimental Social Psychology* (2006), available at: <https://www.ncbi.nlm.nih.gov/pubmed/25798822>.

⁵⁸ See: Boyd-MacMillan, this issue.

⁵⁹ Alia Crum, Peter Salovey, and Shawn Achor, “Rethinking Stress: The Role of Mindsets in Determining the Stress Response” *Journal of Personality and Social Psychology* 4:104 (2013): 716-733, available at: http://goodthinkinc.com/wp-content/uploads/CrumSaloveyAchor_RethinkingStress_JPSP2013.pdf.

⁶⁰ Crum and Salovey, “Rethinking Stress” adapted from Carol Dweck, “Can personality be changed? The role of beliefs in personality and change,” *Current Directions in Psychological Science* 17 (2008): 391-394, <http://cdp.sagepub.com/content/17/6/391.abstract>.

or both. By *transforming the very experience of stress from a demand into a resource*, holding a stress is enhancing mindset can help foster a challenge response, and in turn, support thinking that is more complex.⁶¹

Another finding is that holding a stress is enhancing mindset can help bolster positive affect under stress and increase cognitive flexibility in a challenge state, both of which, we would argue, are important to increasing or maintaining complexity under stress.⁶² Finally, a stress mindset may influence appraisals by shaping the appraisal of physiological and emotional arousal itself. Studies have shown that interpreting one's physiological and emotional signs of stress (e.g. increased heart rate, sweaty palms, anxiety) as facilitative to the task at hand can help bring about a challenge instead of a threat response, in turn supporting complex thinking.⁶³ As in the case of positive reappraisal, embracing stress may not necessarily remove the negative emotions related to stress. Rather, it seems to *add* positive emotions to the appraisal.⁶⁴ For example, if you believe that stress can make you stronger, then even in the face of extreme stress you are more likely to find the positive aspect of the situation or look for ways that you are growing in the midst of stress. In this way, a stress is enhancing mindset can add positive emotions, helping to broaden one's thinking, expand perception of possible resources, help to build those resources, and make it more likely that one can operate productively under stress.

One may have observed that both of these approaches, cognitive reappraisal and mindsets, deal with *subjective* evaluations. These strategies, used in IC interventions, may prove particularly useful in contexts where external realities are especially difficult to change, at least in the short term, but where influencing subjective evaluations could help foster prosocial behaviors that positively influence downstream realities. Stress mindsets and appraisals are open to intervention not only because they are subjective, but also because

⁶¹ Christopher Kilby and Kerry Sherman, "Delineating the relationship between stress mindset and primary appraisals: preliminary findings," Springer Plus 5:336 (2016), available at: https://mbl.stanford.edu/sites/default/files/crum_et_al_stress_mindset_in_challenge_and_threat_12.6.15_ur.pdf.

⁶² Alia Crum, Modupe Akinola, Ashley Martin, and Sean Fath, "The Benefits of a Stress-enhancing Mindset in Both Challenging and Threatening Contexts" Under Review, (2016).

⁶³ Jeremy Jamieson, Matthew Nock, and Wendy Berry Mendes, "Mind over Matter: Reappraising Arousal Improves Cardiovascular and Cognitive Responses to Stress," *Journal of Experimental Psychology* 3:141 (2012): 417-422, available at: <https://www.ncbi.nlm.nih.gov/pubmed/21942377>.

⁶⁴ Ibid.

beliefs about stress are not typically entrenched or particularly value-laden. For example, in stress mindset interventions, stress mindset was significantly altered and maintained over time just by watching a three-minute video clip about the enhancing nature of stress.⁶⁵ In other words, it may be vastly more effective and desirable to equip participants with more adaptive stress mindsets and emotion regulation techniques than to attempt to change behavior by appealing to reason alone, a strategy that has been known to backfire.⁶⁶ This is not to suggest that these approaches are a clandestine form of manipulation; on the contrary, IC interventions are designed to equip participants with the ability to navigate the complex interplay of stress, emotion, and reason as participants shape their own values, goals, beliefs, and behaviors.

A critical component underlying this model is the importance of one's goals and values. Appraisal theory suggests that a situation without relevance to oneself or one's goals will not elicit a stress response, and, as noted, the BPS model specifically examines motivated performance situations.⁶⁷ In the IC literature, the *cognitive manager model* predicts that one will not do the work of raising complexity without adequate motivation, which helps prioritize information processing.⁶⁸ According to Tetlock, one way this motivation emerges is through *value pluralism*, that is, when conflicted parties recognize, either consciously or outside of conscious awareness, personally important values in tension with one another.⁶⁹ Value tensions may also help to explain why even the disruptive stress hypothesis predicts that low levels of stress increase complexity compared to no stress.⁷⁰

⁶⁵ Crum and Salovey, "Rethinking Stress"

⁶⁶ Victoria Romero, "How ISIL Recruitment Tactics Target the Adolescent Brain," Rachel Wurzman and William Casebeer, "Predicting and Reducing Hostility: Insights from Cognitive Models and Cognitive Behavioural Therapy," and Christophe Morin, "The Urgency to Shift Paradigm On the War Against ISIS in The Narrative Space," White Paper on Assessing and Anticipating Threats to US Security and Interests: A Bio-Psycho-Social Science Approach to Understanding the Emergence of and Mitigating Violence and Terrorism (Washington, D.C.: A Strategic Multi-Layer (SMA) Periodic Publication, March 2016): 37-42, 128-145, 159-165, available at: <http://nsiteam.com/social/wp-content/uploads/2015/12/Anticipating-Threats-to-US-Security-Interests-MAR-2016.pdf>.

⁶⁷ Seery, "Challenge or Threat?"

⁶⁸ Peter Suedfeld, "Cognitive Managers and Their Critics" *Political Psychology* 3:13 (1992): 435-453, available at:

http://www.jstor.org/stable/3791607?seq=1#page_scan_tab_contents.

⁶⁹ Philip Tetlock, "A Value Pluralism Model of Ideological Reasoning," *Journal of Personality and Social Psychology* 4:50 (1986): 819-827, available at: <http://faculty.haas.berkeley.edu/tetlock/vita/Philip%20Tetlock/Phil%20Tetlock/1984-1987/1986%20Value%20Pluralism%20Model%20of%20Ideological%20Reasoning.pdf>.

⁷⁰ Suedfeld, "Cognitive Managers and Their Critics."

Enabling participants to recognize, more consciously and more intentionally, a wider range of their own underlying values at stake in an intergroup conflict is one of the key ways that IC interventions elicit the motivation to raise complexity. As participants practice recognizing value tensions in a range of conflicts, they find motivation to work through those tensions to find a resolution, expanding cognitive complexity in the process.⁷¹

Preliminary Findings and Future Directions

Across more than 50 iterations of IC Thinking interventions run in England, Scotland, and Kenya (pre-pilots in Finland, Bosnia-Herzegovina, Sweden not yet assessed, and development underway in Pakistan and Northern Ireland), integrative complexity increased significantly in youth and adults.⁷² If increased cognitive complexity is linked with more adaptive stress responses, then we might also expect to see signs of increased coping abilities emerging alongside increased complexity. In an exploratory study, resilience measures, using the Connor-Davidson Resilience Scale (CD-RISC), were added alongside integrative complexity measures as part of a wider assessment of the IC intervention, I SEE! Scotland.⁷³ Designed to address sectarianism by resourcing diverse communities, the intervention includes exercises targeting emotion regulation skills that could help foster a challenge response under stress.⁷⁴ Consistent with our prediction, both complexity and resilience scores increased significantly.⁷⁵ The specific items in the CD-RISC that demonstrated the most significant and consistent increases were those pertaining to self-efficacy and the ability to cultivate positive emotion under stress (e.g. *Past successes give me confidence in dealing with new challenges and difficulties*, and, *I try to see the humorous side of things when I am faced with problems*). These results further point to the role that positive emotion and a challenge response to stress might play in increasing complexity. However, as the CD-RISC does not claim validation of sub-scales,

⁷¹ Liht and Savage, “Preventing Violent Extremism through Value Complexity.”

⁷² See note 5 for more.

⁷³ Kathryn Connor and Jonathan Davidson, “Development of a New Resilience Scale: The Connor-Davidson Resilience Scale (CD-RISC),” *Depression and Anxiety* 18 (2003) 76-82, available at: <https://www.ncbi.nlm.nih.gov/pubmed/12964174>.

⁷⁴ Includes those who do and do not feel affected by sectarianism

⁷⁵ See Boyd-MacMillan, this issue, or other reports: E. Boyd-MacMillan, “Final report on I SEE! Life Skills for a Changing Scotland project effectiveness empirical evaluation,” IC Thinking (Cambridge) Ltd., April 2015, submitted to the Community Safety Unit, Scottish Government; E. Boyd-MacMillan, “I SEE! Scotland/ IC Thinking End of Year Report 2015-2016 Tackling Sectarianism Programme,” IC Thinking (Cambridge) Ltd., April 2016, submitted to Community Safety Unit, Scottish Government.

more research is needed to further examine the exact mechanisms that account for the intervention's ability to increase resilience and complexity.⁷⁶

Development of another intervention that builds skills in emotional intelligence, emotion regulation, and stress mindset as a path towards increasing complexity is currently underway. The course has been pre-piloted with young adults in Bosnia-Herzegovina with further piloting and evaluation forthcoming. This research promises to offer pragmatic, theoretical, and empirical insights into how we can foster the cognitive and affective skills crucial to primary prevention of violent extremism and intergroup cooperation.

Finally, much of the evidence presented here relies upon correlational measures. Future experimental research should test these hypotheses more directly by integrating cognitive, affective, and physiological measures as well as controlled manipulations of affect to elucidate further the relationship between stress, positive emotion, and integrative complexity. Future efforts could also explore whether certain discrete positive emotions are more effective than others at enhancing complexity (e.g. Is *interest* more effective in promoting complexity than *gratitude*?), and if so, which particular strategies are most effective in self-generating these specific emotions.

Conclusion

In summary, decades of research in integrative complexity have demonstrated the importance of cognitive complexity in the realms of decision-making, conflict resolution, and countering violent extremism. Since stress is likely unavoidable in these contexts, interventions that seek to leverage gains in integrative complexity must also learn how to leverage stress. By drawing upon the biopsychosocial model of challenge and threat and the “broaden and build” model of positive emotion, we have identified key openings for intervention to help engender a stress response that may prove beneficial instead of disruptive to complexity, and by extension, beneficial to transforming conflict.

⁷⁶ Jonathan Davidson and Kathryn Connor, “Connor-Davidson Resilience Scale (CD-RISC) Manual.” Unpublished. To request, see: <http://www.cd-risc.com>.