


Editorial

Resilience in development: Pathways to multisystem integration

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Introduction

The twentieth century has brought a rising tide of disasters threatening life as we know it around the world – including terror attacks, ethnic/tribal conflicts, and war; a global pandemic, famine, financial calamities, and natural disasters – creating unprecedented numbers of displaced people and bringing a frightening reality to looming consequences of climate change. These threats vary in many ways, but they are all multisystemic in nature, requiring multisystem, coordinated responses to prevent massive casualties or harm to human well-being and future development (Masten, 2021; Sanson et al., 2022; Ungar, 2021). In these turbulent and ominous times, it is not surprising to observe a surge of interest in the concept of resilience across many disciplines and sectors concerned with health and well-being in human lives and the ecologies that support human development, as well as all other living things that human lives depend upon (Cinner & Barnes, 2019; Folke et al., 2021; Masten et al., 2021; National Academies of Sciences, Engineering, and Medicine, 2021). Moreover, it is becoming clear that children are particularly vulnerable to the ravages of war, climate change, and related disasters (Masten et al., 2015; Oberg et al., 2021; Sanson & Masten, 2023; UNICEF, 2021)

This special issue was inspired by the 42nd Minnesota Symposium on Child Psychology, of the same title as this special issue, hosted by the Institute of Child Development at the University of Minnesota and held in October of 2022. When the faculty of the Institute were planning the first in person symposium, as we were emerging from the COVID-19 pandemic, the topic of this symposium seemed like a natural focus and the three of us agreed to organize the symposium and plan for this special issue. The topic was timely not only from the relatively short-term perspective of the pandemic, but also with respect to the history of resilience in developmental science and more specifically the history of this journal.

The history of developmental psychopathology and resilience science are closely intertwined, with many shared roots, principles, and scholars (Cicchetti, 1984, 1989, 2013; Garmezy et al., 1984; Luthar et al., 2000; Luthar, 2006; Masten & Cicchetti, 2016; Masten, 1989; Rutter & Sroufe, 2000). This journal has played a central role in disseminating and shaping developmental resilience science over the years. The most cited paper in *Development and Psychopathology* to date is a review of the first generation of childhood resilience research (Masten et al., 1990). In 1993,

Cicchetti and Garmezy edited a special issue on *Milestones in the Development of Resilience* that highlighted classic work by Werner (1993), Egeland, Sroufe, and their collaborators (Egeland et al., 1993), Baltes and colleagues (Staudinger et al., 1993), Cowen and colleagues (Wyman et al., 1993), and many others. In 2007, Cicchetti and Curtis edited another special issue of this journal on resilience, *A Multilevel Approach to Resilience*, that documented advances in multilevel approaches to resilience in developmental psychopathology. That special issue captured the expansion of resilience studies to multiple levels, including neurobiological and molecular genetics research made possible by technological advances in assessment; diversification in methods and levels of analysis; a growing focus on process; and the shift to definitions of resilience based on developmental systems theory. In that issue, Masten (2007) described four waves of progress in resilience science: “Resilience in developing systems: Progress and promise as the fourth wave rises.” The fourth wave referred to the increasing focus on “multilevel analysis and the dynamics of adaptation and change” (p. 921). Masten defined resilience as the “capacity of dynamic systems to withstand or recover from significant disturbances,” reflecting the rising dominance of systems theory in developmental research. Luthar & Brown concluded the 2007 special issue by applauding the new attention to biological processes and methods while also calling for greater attention to context, qualitative methods, family processes, and discrimination in resilience research. This 2023 special issue reflects fifteen years of progress in these directions.

Three decades past the 1993 special issue and nearly two decades since the 2007 special issue, it was timely to feature resilience science again, with a focus on multisystem processes. This issue provides striking signs of progress as well as new directions for future research, illustrating enduring themes as well as evolution and change in theory, research questions, methods, applications, and issues in developmental resilience science. These papers reflect the growing urgency of addressing threats posed to human development by structural inequities, historical injustice and mass-trauma adversities that affect large populations, such as the pandemic and refugee crises, with the looming specter of climate disasters. In the following sections, we highlight themes in the study of resilience evident in this issue, concluding with a set of principles that we see as characteristic of the emerging science on multisystem resilience.

Signs of continuity and change in a maturing science

While there are signs of continuity in the aims, findings, and implications of resilience science, there also are signs of change and differentiation, as one would expect in a maturing domain of

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science. The motivating question at the heart of resilience research remains, albeit in various forms: *What can we do to foster resilience in human development?* More particularly, what are the strategies for lowering or mitigating risks posed by adverse experiences, increasing resources or access to resources, and mobilizing processes that buffer and protect development against adversities? At the same time, this issue and the broader literature reflect a growing appreciation that answering big questions in developmental resilience science requires a deep and nuanced understanding of complex multisystem processes. It is becoming clear that progress requires us to *embrace complexity* in our thinking, models, and methods, even as we settle for practical limits in the design and scope of any individual study.

The special issue showcases multisystem approaches to resilience rapidly dominating discourse and research in developmental resilience science. Research has moved on from a focus on multilevel research in the 2007 special issue to more complex and nuanced models and methods. These advances include efforts to capture multisystem patterns of interaction within and across human brains, bodies, minds, relationships, and social communities through frequent precise measurement and powerful new statistical approaches. Additionally, these advances call for reconsideration of qualitative data and what Garnezy (1982) described as “the case for the single case” to facilitate insights into the complexities of human behavior and development. Some of the new “case studies” focus on whole communities (e.g., Ungar et al., [this issue](#)) as well as individuals. There is also considerable support for mixed methods designs that include qualitative and quantitative approaches (e.g., Panter-Brick, [this issue](#); Theron et al., [this issue](#); Ungar et al., [this issue](#)).

There continue to be notable differences in how investigators define or measure resilience. Nonetheless, the articles collected here also reflect the widespread infusion of developmental systems theory into the definitions and study of resilience. From this perspective, interactions among many systems shape individual development as well as the trajectories of the larger systems that surround individuals, such as families, schools, communities, economies, and many other sociocultural and ecological systems. Many of the authors here endorse a systems-oriented definition of resilience, congruent with the trend observed by Masten et al. (2021) in their review of the broader literature. Concomitantly, models presented in this issue reflect efforts to integrate biological, psychological, social, and ecological influences on the development of individuals, families, and communities, in order to understand or facilitate their responses to adversity (e.g., Burrows et al., [this issue](#); Shoychet et al., [this issue](#); Ungar et al., [this issue](#)). Panter-Brick ([this issue](#)) describes these changes through the lens of humanitarian interventions. The roles of historical and local context, cultural influences, discrimination, and oppression are central to many of the articles.

This collection of articles illustrates the long-called-for and now rapidly growing focus on resilience among diverse populations, including indigenous people, survivors of historical trauma, marginalized groups, and forcibly displaced children and families. These articles also document studies engaging researchers and participants in low- and middle-income countries, particularly in the Global South. Studies stemming from the pandemic are emerging; this issue includes a systematic review of the evidence pertinent to Prime’s Family Disruption Model (Prime et al., 2020) of risk and resilience during the pandemic (Shoychet et al., [this issue](#)). Articles in this issue also reflect the increasing value placed on lived experience, voices of participants, and community-based participatory research.

Major themes

In this section, we highlight five major themes we identified in this special issue. Some reflect the refinement of resilience theory and methods that naturally comes with expanding research and knowledge. Some reflect contemporary concerns about systemic injustice and unprecedented global migration, often due to forced displacement. Still others likely reflect the growing diversity of researchers and participants engaged in developmental research on resilience.

Historical systems of injustice, subjugation, oppression, and structural discrimination pose unique, profound, and multisystem threats to development

A striking theme in the Minnesota Symposium and this special issue as a whole is the necessity of confronting the unique and pernicious threats posed to development by systemic injustice, historical oppression, pervasive discrimination on the basis of race or ethnicity, and intergenerational trauma (e.g., Jones et al., [this issue](#); Murry et al., [this issue](#); Panter-Brick, [this issue](#); Spencer et al., [this issue](#); Wilbur & Gone, [this issue](#)). These authors offer a resounding rebuke to the idea that the victims of systemic threats should be expected to overcome entrenched structural injustices to flourish and thrive, even though there is evidence of resilience observed in oppressed peoples at multiple system levels (individual, family, cultural); dismantling injustice requires the “haves” or benefactors of these injustices to act (Jones et al., [this issue](#); Murry et al., [this issue](#)). In other words, these “toxic upstream waters” (Murry et al., [this issue](#)) and the profound inequalities stemming from historical trauma, slavery, and colonialization require transformational change. At the symposium, Dr Anderson focused on pushing back and fighting against racialized adversity as distinct from resilience to achieve the disruptive transformation needed in the context of systemic racism (elaborated in the article by Jones et al., [this issue](#)). Dr Murry argued similarly at the Symposium, expanded further in this issue, that Black young people should not require a protective “rubber suit” (representing multisystem resilience and protections) to navigate the toxic waters and thrive in U.S. society; they have the right to “clean waters” (Murry et al., [this issue](#)). Murry and colleagues also describe the importance of “resistance for liberation” or what they indicate might be called “resilient resistance” (Murry et al., [this issue](#)).

Multiple authors in this issue provide a rich picture of theory and research focused on populations of young people who face the multisystem threats of historical trauma and oppression. Dr Spencer, in her Symposium address and with her colleagues in this special issue, underscored the longstanding history of scholars who have made unique theoretical contributions to the literature on risk and resilience, by reframing concepts in the context of injustice. Spencer herself made seminal contributions to this effort, with her Phenomenological Variant of Ecological Systems Theory, as did Cynthia Garcia Coll and colleagues in their classic paper on this theme (Garcia Coll et al., 1996) and in later works (Marks et al., 2020). Murry and colleagues chronicle decades of theory and research on risk and resilience among African American people, beginning with early, deficit-oriented studies and evolving to multisystem, strength-focused waves. They describe classic research on biological weathering, demonstrating potential costs of thriving at a sociocultural level when enormous efforts are required to overcome toxic environments.

Interest in the issue of long-term costs to health of striving for success among children growing up in high-risk contexts dates back to pioneering studies of resilience, such as the Children of

Kauai (Werner & Smith, 1992). However, the special issue highlights growing attention to the hidden costs of resilience in contexts of oppression and systemic injustice. The biological processes that could account for such costs have been variously described as weathering (Geronimus, 1992), allostatic load (McEwen, 2020), and skin-deep resilience (Chen et al., [this issue](#)). The unique relevance of this phenomenon to Black youth growing up in the United States is underscored by the concept of John Henryism, recently tested in a study of allostatic load among a low-income sample of children by Tyrell et al. (2023).

Indigenous people in the Americas and other colonized regions of the world also have experienced extraordinary historical trauma and injustice. The concept of “survance” described by Wilbur and Gone ([this issue](#)) is another concept recognizing the need for unique perspectives on resilience among oppressed populations, with support for active resistance. They describe the history of this concept (originally described by the Anishinaabe scholar, Gerald Vizenor, in 1994) and its growing popularity among Indigenous scholars. They describe survance as a “combination of *survival* and *resistance*” representing “continuation through stories and active presence.” Wilbur and Gone review publications on survance, primarily but not exclusively in North America, concluding that “*as resilience is to trauma, so survance is to Indigenous historical trauma*” ([this issue](#)). Wilbur and Gone note the central roles in survance research on traditional cultural practices, which may require reclaiming and restoring traditional cultural practices embedded in language, stories, music, dance, and spiritual rituals. Sovereignty, including agency, also was a strong theme revealed by the reviewed literature on Indigenous survance.

John-Henderson et al. ([this issue](#)) provide a scoping review of the literature on protective factors among American Indian and Alaskan Native populations. Some of the resilience factors observed in their review reflect the unique cultural heritage of diverse Indigenous people (specific cultural traditions and practices) while others are very familiar from reviews of the broader literature on protective factors, such as social support, a sense of mastery or control, emotion regulation, and hope.

The articles focused on this theme raise the important question of whether multisystem models of resilience can encompass the necessity of dismantling harms and injustices wrought by historical trauma, colonialism, systemic racism, structural violence, and other forms of unjust oppression. Certainly, the prevention or mitigation of cumulative risk, including exposure to adverse experiences, has long been viewed as a strategy for fostering resilience and positive development more broadly. Preventing, reducing, or mitigating exposure to adversity is one of three basic strategies for intervention implicated by models of resilience described by Masten (2014, 2021). Nonetheless, from a multisystem perspective, we suggest that it is essential to recognize the unique challenges as well as the necessity of dismantling injustice arising from historical trauma and oppression to address vulnerabilities and risks that have accumulated over generations (e.g., through “decolonization” practices). It also is important for us to recognize that solutions to deeply embedded, multisystem threats of this kind are likely to require multisystem strategies that disrupt and transform structural systems, as well as multidisciplinary knowledge and multisector collaborations.

Integrate culture and context in models and methods at all system levels

In addition to the specific focus on historical contexts of colonialism, oppression, and racism, the special issue highlights

more broadly the expanding integration of culture and socio-ecological context in theory and research on resilience, both basic and applied. At the Minnesota Symposium, Dr Michael Ungar described the evolution of resilience research on children and youth toward greater cultural and contextual sensitivity and processes, perspectives that he and his collaborators have championed for many years (e.g., Ungar, 2008), often through activities and projects supported or facilitated by the Resilience Research Centre in Halifax. He also addressed the complexities and challenges of designing studies to account for multisystem processes related to socioecological contexts and cultures. In their paper, Ungar et al. ([this issue](#)) describe the challenges of measuring multiple systems and detecting patterns among them over time, arguing that mixed methods (e.g., network analysis, combined with qualitative strategies) are often essential to grasping these complex processes. They describe their recent studies of youth in communities dependent on the economically turbulent oil and gas industries in three different countries and highlight two community-level case examples in Canada to illustrate how they implemented their “six-phase transformative sequential mixed method design.” Though their results are complex, they observed that young people with more resources, more connected resources, and/or more diverse contextual resources often fared better during worsening economic conditions (and the pandemic) with respect to symptoms of depression. Ungar encourages future investigators to paint a rich picture of change in multiple systems using mixed methods that combine innovative designs, culturally and developmentally sensitive measures, and varying time scales.

Theron et al. ([this issue](#)) also applied mixed methods in their study of resilience among older adolescents in South Africa, which also focused on depression. They identified trajectories of depression that were then related to multisystem protective systems and “resilience-enabling resources.” Despite severe and chronic adversity, most of these young people showed low or declining trajectories of depression symptoms in conjunction with constellations of diverse resources, including culturally meaningful combinations of family-community and faith-based supports congruent with traditional African values.

Increasing research on resilience among immigrant youth and refugees also illustrates the growing attention to context and culture at multisystem levels in theory and research. Dr Frosso Motti-Stefanidi in her Symposium presentation and her paper ([this issue](#)) has described the integrated multisystem resilience model she and her colleagues developed, integrating concepts from developmental models of competence and resilience, acculturation theory, and social psychological models. Her studies have yielded unique insights into the processes of resilience among immigrant youth in Greece related to acculturation, underscoring the importance of interactions among multilevel systems (e.g., socio-political context, national attitudes about assimilation, supports for education of immigrant youth, class configurations of immigrant and native youth, peer relations with immigrant or native friends and classmates, ethnic and national identity). Her paper also applies an anti-racist lens to the findings from her studies in Greek schools, arguing that the lived experiences of immigrant youth reflect the pervasive and systemic xenophobia and anti-immigrant attitudes in Greek schools and society. Motti-Stefanidi argues that equitable and inclusive education will benefit all students in Greek schools, as well as immigrant youth.

In the completely different context of urban middle schools in California, where school populations also are increasing in racial/ethnic diversity (although majority Latinx in this context), Graham

and Echols ([this issue](#)) came to a similar conclusion about the benefits of classroom diversity. In their study of school and classroom racial/ethnic diversity as an influence on peer victimization, exposure to “dynamic” classroom diversity (referring to a student’s individual exposure to diversity in classes over the school day) in their middle school classes had positive effects on the association between peer victimization and self-blame as well as perceived school safety. Moreover, dynamic classroom diversity was more protective against effects of victimization than “structural” school diversity (based on static enrollment proportions). They also found that having friends can be protective in the transition to middle school, a common finding in the literature for this age group, but that the effects of friendships also related to whether those friends were victimized. Research by both sets of researchers (Graham & Echols as well as Motti-Stefanidi, [this issue](#)) illustrates how attention to contextual nuances supports understanding the well-being of diverse students in classrooms and schools. These investigators also suggest that student diversity can be beneficial to *all* students.

Burrows et al. ([this issue](#)) propose an “Ecological Research Framework” in their paper, illustrated by the Justice Ambassadors Youth Council (JAYC) program in New York. Their work is focused on creating and sustaining an ecology that supports and sustains resilience in young adults contending with chronic adversity. The JAYC program was designed to foster resilience along a continuum from individual to the community and policy levels; youth trained during this 12-week program have opportunities not only to reflect on their own experiences and goals but also to access resources and interact with policy makers. Like many of the papers in this special issue, these authors note the role of social connectedness, a sense of belonging, identity, agency, and empowerment for building the resilience of youth. The JAYC program affords youth opportunities to voice and apply their knowledge from lived experience to make a difference.

In a further example of expanding research on broader community-level ecologies, Okuzono et al. ([this issue](#)) drew on data from the National Survey of Children’s Health to study the role of neighborhood resources and community social capital for children’s mental health. They found protective effects of social capital, but these were specific to children who had less exposure to interpersonal racial/ethnic discrimination.

In her talk and contributions to this special issue, symposium speaker Dr Catherine Panter-Brick – who has brought the cultural lens of an anthropologist to the study of resilience for many years – tackled the provocative topic of whether multisystem approaches add value to research and intervention in contexts of war and forced displacement. She has examined this question through a discussion of four types of added value: conceptual (knowledge), instrumental (implementation), capacity-building (research skills), and connectivity (strengthening network humanitarianism). Panter-Brick ([this issue](#)) makes a persuasive case for the benefits of multisystem thinking in humanitarian contexts, drawing examples from her collaborative work in Afghanistan and with Syrian refugees. Her research and intervention projects not only illustrate multisystem methods (from biomarkers to culture), but also her focus on generating evidence that informs policy and practice and clearly articulating for all stakeholders the value added of multisystem resilience work. Collaborative work of scholars like Panter-Brick with humanitarian agencies illustrates the potential of multisystem thinking and multisector collaboration for refining theory as well as designing interventions.

The paper by Smeeth et al. ([this issue](#)), including senior author Michael Pluess, provides another example of multisystem research in a humanitarian context, although their focus in this paper is on biomarkers of risk or resilience. In the BIOPATH study of Syrian refugee children in Lebanon, Pluess and colleagues studied risk and resilience in this population of youth exposed to severe war trauma. Smeeth et al., report here on risk and moderating effects on mental health symptoms associated with polygenic scores (for depression, self-harm, neuroticism) and hair cortisol assessments as biomarkers. As is often the case among studies of war trauma, resilience was defined by lower symptoms of mental health problems. Higher levels of hair cortisol were associated with more symptoms and an interaction effect of high cortisol with polygenic risk for depression suggested that this combination might elevate risk for mental health problems.

Multisystem processes related to caregiving and family processes

The central focus on caregiving and family processes in the literature on resilience in children and youth endures, prominent since the pioneering days of resilience scholarship (Garmezy & Rutter, 1984; Masten et al., 1990). This large and growing area of multisystem work continues to become more theoretically nuanced as well as methodologically sophisticated, while also overlapping in many ways with the themes discussed above. Many of the papers that focus on family processes are grounded in systems theory related to family dynamics and transactional interactions. The evidence on resilience related to caregiving has expanded well beyond dyadic interactions to include processes linking neurobiology, behavior, family function, and support systems for caregiving and families.

Dr Dylan Gee focused on the developmental neuroscience of caregiving with respect to resilience in her symposium presentation and her special issue paper (Gee & Cohodes, [this issue](#)), highlighting her team’s research on the effects of caregiving on cortic limbic brain circuitry and emotion regulation. Their paper describes the broad central role of attachment with caregivers in childhood, as well as the role of caregiving in resilience, with caregivers providing security and predictability in the home environment and facilitating the development of emotion regulation in their children. Their conceptual framework represents a moderated mediation model in the context of adversity, whereby caregiving moderates the effects of adversity on the brain and related behavioral development of children which in turn mediates effects of adversity on mental health outcomes. They review the evidence that caregivers can buffer the biobehavioral effects of adversity in multiple ways. Additionally, they describe the growing evidence on developmental timing that suggests windows of plasticity when effective or harmful caregiving has more effect on development, as well as periods when recalibration of stress-response systems may occur (when positive caregiving may have more effect). Stress research points to puberty in early adolescence as a period of potential recalibration of the HPA axis, when positive caregiving could alter the stress-response system in healthier directions (Gunnar et al., 2019). The central role of caregiving on development has profound implications for intervention, particularly in the context of high adversity exposure. Adversity may disrupt caregiving at crucial times for both current and future development. Thus, there is a strong case for boosting the quality of parent-child attachment relationships and parenting skills as crucial buffers against adversity for children. Gee and Cohodes

argue that interventions can be designed with greater precision to fit the multisystem profiles of family and child lives, attuned to developmental timing and other circumstances.

The role of caregivers in the calibration and recalibration of stress systems also is the focus of Howland's review ([this issue](#)) on another potential window of high plasticity and change in stress regulation systems: the perinatal period of pregnancy, lactation, and early parenthood. The perinatal period can be viewed as a developmental "switch point" and sensitive period with significant biological and social role changes. Brain remodeling in this window that sets the stage for maternal caregiving behavior may also be neuroprotective in some ways for future development of mothers. Howland reviews evidence available to test the perinatal stress recalibration hypothesis and what is needed. In light of the evidence, Howland argues that perinatal stress recalibration may be a process through which multilevel, multisystem changes alter development in adulthood and influence the intergenerational transmission of risk or resilience.

Shoychet et al. ([this issue](#)) carried out a systematic review of publications that test Prime's COVID-19 Family Disruption Model (FDM) of risk and protective processes during the pandemic (see Prime et al., 2020, 2023). FDM represents a cascade model for understanding how adversity can disrupt family functioning with spillover consequences for child or youth well-being and development. Shoychet and colleagues provide an overview of the model and its origins in developmental systems theory (bioecological models), family stress theory, and resilience theory and then evaluate the results of their pre-registered systematic review of studies available by the summer of 2022. Results provide supportive evidence for the FDM as well as needed refinement. Evidence shows the disruptive effects of COVID on caregiving and family function, with cascading effects to child behavior, particularly for internalizing problems. However, results also offered support for stress-inoculation, sometimes described as "stress adapted" effects, wherein families with prior exposure to moderate stressors handled pandemic stress more effectively, suggesting an area where the FDM needs to be improved. Results indicated both vulnerability effects (moderators that appear to increase adversity effects) – such as prior economic hardship and prepandemic mental health problems in children or adolescents – and protective moderators, including working from home during the pandemic and social support from the family. Although the FDM was developed for the COVID-19 pandemic, the concepts and results this paper describes have broad implications for future threats, such as climate change, that will also threaten caregiving and family function. It is crucial for communities and societies to prepare for future disasters by building family resilience (Prime et al., 2023).

Wang et al. ([this issue](#)) utilized a daily-diary approach in a national sample of U.S. adolescents to examine the interplay of remote learning with perceived parent support and stress. Importantly, their study began before the pandemic and continued into 2020 as schools adopted remote learning. On days of remote learning in the spring of 2020, adolescents reported lower positive affect, more stress, and higher parent support. On days with higher parent support, adolescents reported less stress, less negative and more positive affect. These were main effects (rather than moderating effects) – consistent with the possibility of compensatory efforts by parents to respond to the needs of their adolescents during this initial period of the pandemic (when many adolescents and parents spent an unusual amount of time at home together). Peer support also was related to more positive daily affect, underscoring the role of peer relations in psychological well-being

of teenagers. Their data did not show declining well-being over time during this particularly disruptive period of the pandemic, but rather a pattern of affect and stress fluctuating with the daily context (remote learning or not; support of parents and peers). Their findings align well with the review by Shoychet et al. ([this issue](#)). In this generally diverse and lower-income sample, Wang and colleagues did not find racial differences in the effects of remote learning despite the likelihood that Black families and others from minoritized racial/ethnic backgrounds experienced more hardship and illness or bereavement due to the pandemic. They suggest that efforts by schools and communities to provide emergency resources (including food and internet access) may have made a difference.

Feldman ([this issue](#)) focuses her article on the contribution of fathers to human resilience, in a compelling summary of theory and the multisystem literature. Feldman describes the three "tenets" of her developmental resilience model – plasticity, sociality, and meaning – and then discusses the contribution of fathers to each aspect of resilience over the course of development. In prior work on resilience, Feldman (2021) has traced the evolution and development of attachment behavior and parenting in social species, including influences of biological processes (e.g., the role of oxytocin); she has argued that affiliative behavior lies at the core of resilience in human development. In the present paper focused on fatherhood, Feldman describes massive social and cultural changes that have altered the role of fathers, particularly in regard to caregiving. Feldman here notes that "fatherhood is perhaps the most rapidly changing role in the history of the human family" with research on fathers falling behind these changing roles. Feldman emphasizes that fatherhood also is embedded in culture, influenced by structural racism and the disruptive influences of incarceration, migration, and war. Research on Black fathers in the U.S., for example, often has had a deficit focus, neglecting the positive influences of fathers in the lives of Black children (Tyrell & Masten, 2022).

As noted in prior sections, the socioecological context, including systemic racism, political conflict, or xenophobia, influences parent behavior in multiple ways, including the steps parents take to protect and prepare their children for adversity in a hostile context. Wiggins et al. ([this issue](#)) report on their study of nurturant-involved parenting of Black and Latinx children for both psychological well-being and physical health. Their results suggest that nurturing and engaged parents are particularly important for cardiometabolic health when youth are experiencing high levels of stress and discrimination. Their results align with many other results in this issue indicating context-related resilience effects.

Effective interventions will benefit from multisystem thinking and collaboration

Numerous studies in this issue conclude with comments on the implications of the research for intervention or policy, although empirical studies of interventions based on multisystem resilience models remain rare. Typically, in the broader literature on resilience, experiments to test theory lag behind descriptive and basic process studies. Masten (2007) described the emergence of intervention studies that test resilience theory as the "third wave" in developmental resilience science, following the initial two waves: (1) descriptive research (often focused on questions about who shows resilience and what makes a difference in terms of the correlates of better adaptation in the context of adversity) and (2) research focused on processes that might account for variations

observed in the initial wave (e.g., how do promotive or protective influences work?). However, as noted above, randomized controlled trials (RCTs) are the gold standard strategy for testing causal models of promotive or protective effects in resilience models. The fourth wave began with the emergence of multilevel research and now is maturing into multisystem resilience science through a new cycle of development (Masten *et al.*, 2023). Multisystem resilience is advancing through repeated phases of description, efforts to delineate processes, and interventions designed to spur resilience by targeting multisystem processes. Multisystem intervention studies with randomized controlled trials or quasi-experimental designs will be a powerful phase of robust theory-testing.

Perhaps the best examples of multisystem interventions aligned with resilience theory to date are those focused on parenting or parent-child relationships as well as humanitarian interventions in the aftermath of war, migration, and forced displacement (Masten & Cicchetti, 2016; Masten *et al.*, 2015, 2021; Van IJzendoorn *et al.*, 2020). Papers in this issue describe examples of intervention studies focused on caregiving (e.g., Gee & Cohodes, *this issue*). Panter-Brick (*this issue*) describes multisystem humanitarian interventions. Some studies include assessments of change at multiple levels (including biological, psychological, relational, and/or family levels most often) to determine whether interventions targeting one system or level of interaction has spread to other domains or system levels or even generations.

Rhodes *et al.* (*this issue*) present new long-term intergenerational findings from the 15-year follow-up of a well-known randomized controlled prevention trial for bereaved families, called the Family Bereavement Program. These investigators tested for effects of the intervention across generations based on a multisystem model of resilience. Results suggested that the intervention altered the attitudes toward physical punishments in the next generation. In addition, the intervention was associated with improved parental warmth, which predicted fewer externalizing problems of their children during adolescence which in turn predicted less anxiety in romantic attachments and positive attitudes to parental warmth among the second generation in emerging adulthood.

As research accumulates, there are increasing efforts to evaluate interventions and thereby their underlying theories of change. Inconsistencies in models, measures, and methods present difficulties, often leading to reports of systematic reviews that started with the expectation of meta-analysis and ended as narrative reviews due to poor quality or inconsistencies. Registries of interventions provide guidance to creating and using interventions with strong evidence of efficacy, in hopes of improving the quality of evidence on what works. Another strategy for identifying potentially efficacious interventions, based on the compiled consensus of experts, is provided by the Delphi approach, which has been applied in research on disaster response and intervention (e.g., Ager *et al.*, 2010; Ross *et al.*, 2023).

Multisystem models require multisystem methods

Just as intervention studies tend to lag behind descriptive and observational studies, methodological advances tend to fall behind theory and conceptual models. Multisystem models are usually easier to conceptualize than they are to measure and analyze. Yet there are signs of real progress throughout this special issue and the broader literature. There are examples here of multilevel, multisystem measurement and analysis of patterns within and across

levels of measurement suggesting “constellations” of risk or protective processes or networked processes. González-García *et al.* (*this issue*) studied structural brain network topology related to resilient functioning, linking psychosocial functioning in the context of adversity with brain systems; results suggested that more resilient youth had more mature structural network topology. Wigglesworth *et al.* (*this issue*) studied resilience in high-risk adolescents who had experienced mental health problems, investigating how person-centered stress-response profiles were related to psychopathology symptoms and well-being over three points in time. Investigators assessed profiles based on the Trier social stress test. Adolescents self-reported their experienced stress; observers rated their expression of stress; and salivary cortisol output was measured at five points over the course of the stress procedure. Utilizing a multi-trajectory model, they tested and found support for their hypothesis that profiles indicating concordance across systems of stress processing may facilitate resilience even in the context of psychopathology symptoms, either protecting against future illness or promoting recovery, with some caveats. Ungar *et al.* (*this issue*) studied patterns of multisystemic resources systems in applications of network analysis. Cutuli *et al.* (*this issue*) utilized multilevel latent class analysis to identify profiles of data including multisystem risks, services, and early childhood program enrollment information among families with young children experiencing homelessness. Their study drew on integrated administrative data and information from an intervention program (Building Early Links for Learning) designed to enhance early child development for children staying in shelters through multisystem strategies. By illuminating the complex patterns among risks, assets, and services, their goals were to inform and refine community programs for a very high-risk group of children and families.

Recent efforts to capture multisystem indicators of promotive and protective factors are represented here by the work of Narayan *et al.* (*this issue*) on positive childhood experiences. In this article, these investigators present new work on the Benevolent Childhood Experiences scale (BCEs), which they are in the process of revising. Items range from “Did you have at least one caregiver with whom you felt safe?” to “Did you have access to food that was healthy and nutritious?” to “Did you have adequate law enforcement in your community that made you feel safe?” BCEs is an example of measures of positive childhood experiences (PCEs) designed as counterpoints to assessments of adverse childhood experiences. One of the most widely used measures of current (rather than past) multisystem resilience is the Child and Youth Resilience Measure (CYRM) developed by collaborators affiliated with Ungar’s Resilience Research Centre, which has multiple forms and is available in multiple languages. Several studies described by authors in the special issue have used the CYRM (e.g., Panter-Brick, *this issue*; Ungar *et al.*, *this issue*). Smartphones, satellites, imaging, and other digital technologies have made it possible to collect more intensive data on moment to moment change in human brain function, mood, or stress biology, as well as the dynamic interplay of interacting systems within and across levels of analysis, from genes to immune function to communities (see Wang *et al.*, *this issue*, described above for the example of daily-diary assessments). Technological advances have made it possible to collect detailed data in the field or in the lab and integrate such data across multiple investigators in search of clues to prevent psychopathology or promote resilience and adaptive trajectories.

Statistical strategies for modeling resilience processes are emerging. Hasselman (*this issue*) describes the methods developed

in other fields for assessing the behavior of complex dynamical systems. His paper provides a guide for multisystem thinking and encouragement that there is a way forward for investigators to match their methods and analyses to the complexity of development, whether of psychopathology or positive adaptation in the context of adversity and risk. His purpose, Hasselman states, is to “demonstrate that a research program based on a *strong complexity assumption* is possible.” He describes the toolbox of methods and analytic techniques that have the potential to illuminate the idiographic complexity of individual behavior and development, including case studies, experience sampling methods, and qualitative modeling. Complexity methods, he asserts, elevate *dynamics over content*.

Efforts to embrace complexity in the study of resilience and psychopathology point to the value of disciplinary interaction in education, to prepare for solving “wicked” problems and addressing global threats to life and the planet that are clearly multisystemic, such as pandemics and climate change. Complexity dynamics and multisystem studies of adaptive or maladaptive behavior also point to different conceptualizations of causality. There is more attention now to transdiagnostic effects of risk, vulnerability, promotive or protective processes in research on psychopathology and resilience (e.g., Kasparek et al., [this issue](#); Masten et al., [2021](#); McLaughlin et al., [2020](#)).

New questions and emerging principles of multisystem resilience models

The 2022 Minnesota Symposium and the publications comprising this special issue illustrate ongoing advances in developmental resilience science and particularly the emerging focus on multisystem models and methods. Scholars are refining their questions and raising new questions as the evidence expands and new methods open up new directions for investigation. There is growing interest in the dynamics of resilience across systems, system levels, and time (on varying time scales) and the patterns and processes that span multiple systems. Issues raised by structural racism, discrimination, persecution, historical trauma, and multisystem disasters have taken center stage. Nonetheless, there continues to be a striking familiarity in the promotive and protective processes identified across diverse studies and situations that the early pioneers in developmental resilience science, including Norman Garmezy, Lois Murphy, Michael Rutter, and Emmy Werner, likely would recognize. And finally, we think the parameters are taking shape that define an emerging multisystem developmental science of resilience.

Provocative new questions have emerged along with more nuanced models and measures in the study of human resilience. Here is a sample.

- Under what conditions does adversity improve adaptive functioning?
- How do power dynamics and oppression influence risk and resilience?
- What does it mean to “adapt successfully” to injustice?
- Is resistance against oppression a form of resilience?
- How do we collectively address the structural injustices and systemic threats that require individuals, families, and communities to be resilient?
- What are the costs at a biological level for resilience at a sociocultural level and vice versa?

- How are transdiagnostic buffers of adversity related across time and systems?
- How do resilience “portfolios” or “constellations” arise?
- How does intergenerational transmission of resilience occur?

Organizing the symposium and editing this special issue affirmed to us that we have started along an exciting pathway to a more integrated science of multisystem resilience in human development. Of course, there is much work yet to do, as well as growing urgency for integrating knowledge across sciences and taking action across sectors and systems to prepare for existential threats to human life and development that loom ahead.

In conclusion, we offer a preliminary set of principles characterizing multisystem perspectives on human resilience that we have distilled from the symposium and this special issue. By resilience, we refer broadly to *the capacity of a complex dynamic system to respond to significant challenges or threats in ways that preserve or enhance the life, healthy function, and future development of that system*. We recognize that some disciplines have a neutral view of resilience (i.e., there is no judgment or criterion that resilience be associated with positive adaptation or healthy functions and outcomes), as noted by Hasselman ([this issue](#)). However, we think that the evolution of the concept in psychology and developmental science has carried some expectation of positive adaptation. Thus, for example, the stability of a persistent mental illness that compromises adjustment or well-being would not be viewed as a pathway of resilience in most resilience theory in the psychological sciences; instead it would be viewed as a maladaptive pathway, suggesting risk and vulnerability processes rather than resilience. Similarly, a person who becomes a successful tyrant or war criminal, despite (or because) of adversity would not be described as manifesting resilience. Nonetheless, we also recognize that adaptive systems that evolved and typically function to protect positive development or protect development against adversity can be co-opted for antisocial goals. We also recognize that adaptive success defined at one level of analysis or in regard to one domain of function or on one timescale or at one age or in one culture may be not be associated with resilience viewed from another level, domain, time frame, age, or culture. We believe that understanding such complexities is a central goal of multisystem resilience science.

As this special issue is published, we suggest the following principles to summarize prevailing principles of multisystem resilience in developmental science at the present time.

1. Resilience is a broad systems concept referring to the adaptive capacity and processes involved in effective responses to system disturbances.
2. Individual human resilience arises from the interactions of many systems within and outside the person. (The same could be said of family or community resilience.)
3. Resilience is dynamic and emergent, changing with experience and multisystem interactions.
4. Constellations of interconnected resources and interacting protective systems generally enhance resilience capacity.
5. Resilience varies by context, criteria (point of view), and level of analysis.
6. Tradeoffs and differential patterns of adaptive success may occur for short-term versus long-term perspectives and for different levels of analysis and subsystems (e.g., behavioral versus physical health, social achievements versus biological weathering).

7. Resilience processes may have transdiagnostic implications.
8. Adversity exposure and stress processes can have positive effects on resilience.
9. Successful interventions often mobilize multiple and multi-level promotive and protective influences through coordinated, culturally and developmentally strategic approaches.
10. Interventions can generate positive cascade effects over time, domains, and/or generations.

Going forward, we anticipate that developmental resilience science will continue to advance and inevitably change as theory, research, and debate continue and new voices emerge. At the same time, we expect that multisystem crises arising across the world in the foreseeable future will call for action informed by the best evidence available at the time, however imperfect. In these perilous times, it is reassuring to observe the progress represented by the articles in this special issue on the pathway toward integrated multisystem resilience science. Effective action to reduce risk and bolster resilience for expected and surprise threats to human life and development in the future is going to require ongoing integration of knowledge about resilience spanning diverse disciplines and systems, contexts, cultures, sectors, and perspectives.

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