

## Special Issue Article

# Resilience in Development: Pathways to Multisystem Integration

## Father contribution to human resilience

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### Abstract

Fathers have been an important source of child endurance and prosperity since the dawn of civilization, promoting adaptation to social rules, defining cultural meaning systems, teaching daily living skills, and providing the material background against which children developed; still, the recent reformulation in the role of the father requires theory-building. Paternal caregiving is rare in mammals, occurring in 3–5% of species, expresses in multiple formats, and involves flexible neurobiological accommodations to ecological conditions and active caregiving. Here, we discuss father contribution to resilience across development. Our model proposes three tenets of resilience – plasticity, sociality, and meaning – and discussion focuses on father-specific contributions to each tenet at different developmental stages; newborn, infant, preschooler, child, and adolescent. Father's style of high arousal, energetic physicality, guided participation in daily skills, joint adventure, and conflict resolution promotes children's flexible approach and social competence within intimate bonds and social groups. By expanding children's interests, sharpening cognitions, tuning affect regulation, encouraging exploration, and accompanying the search for identity, fathers support the sense of meaning, enhancing the human-specific dimension of resilience. We end by highlighting pitfalls to paternal contribution, including absence, abuse, rigidity, expectations, and gender typing, and the need to formulate novel theories to accommodate the “involved dad.”

**Keywords:** fatherhood; resilience; neurobiology of attachment; parent-child relationship; parental brain

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Fathers have been an important source of child endurance, longevity, and prosperity since the dawn of civilization, promoting children's adaptation to social rules, transmitting codes of conduct, defining cultural and religious meaning systems, directing children outward to the wider world, teaching daily living skills, and providing the material background against which children developed. For generations, human capital has been transferred, in the main, from fathers to children, with fathers serving as the central vehicle for the acquisition of money, land, values, goods, character, skills, and standing. The sheer presence of fathers in their children's lives increased not only the child's future prospects but the mere chance to live to maturity. Evidence from pre-industrial Europe shows significantly lower rates of mortality among children with cohabitating fathers and evidence from non-Western societies indicates that men with more land sired more children who lived longer (Flinn, 1986; Geary, 2000; Rubenstein & Wrangham, 2014). Apart from physical protection, the term “father” has been utilized as a metaphor for spiritual, moral, and social protection; the parental figure that protects social order, sets rules, monitors conduct, and epitomizes providence. “Father,” from the Latin word *pater* – a man who has engendered a child – or middle English *pader* – akin to “old” (Merriam-Webster Dictionary, 2002) has grown to embody the provider, moral authority, and benevolent elder and three

millennia of monotheism cemented its image as an internal presence that guides and shelters. Because fathering is a much less biologically determined phenomenon than mothering and its expression assumes a wide phenotypic variability, from sperm only to primary caregiving, fatherhood is a typical example of phenomena that stand at the crossroad of biology and culture (Burkart et al., 2017; Storey & Walsh, 2013). These phenomena are marked by enhanced plasticity and appear in a variety of formats that are molded by ecological constraints, cultural habits, and social hierarchies, which, in turn, shape their biological underpinnings; hence, such phenomena can only be studied on the background of their time and place (Feldman et al., 2019).

The last four decades have seen a reformulation in the role of the father, as indexed by the increased involvement of fathers in child-care responsibilities, the gradual update of traditional family roles, and the growing centrality of parenting in men's lives, and such changes have been reported in 30 Western countries (Schober, 2015). A survey across the United States has indicated that since 1965, there was a 3-fold increase in the number of hours fathers spend with their young children during the week and on weekends and 57% of men indicated that fatherhood is central to their sense of self (Parker & Liveingstone, 2019). The range of childrearing activities has expanded from a little time spent after work in the family context in the 1950s and 1960s to a fully involved father that spends time alone with the child and assumes the full range of childcare responsibilities (Lamb, 2013; Yogman & Eppel, 2022). Notably, both time spent alone with the child and the range of caregiving responsibilities have been linked with more sensitive fathering (Feldman,

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2000) and consolidation of the paternal brain (Abraham et al., 2014). Although marked variations in father involvement exist across cultures, social classes, and individual families, the “involved dad” spells a fresh image that not only reflects social trends but also creates them. The media is replete with images of fathers strolling the park, changing diapers, or walking with infant carriers, celebrities sharing their “father stories” in details, and interviews of alternative families with two dads (Vance, 2020). The climate has shifted so it is currently considered a virtue for “strong men”; professional sports players, mountain climbers, or men in the military, to show their soft side and engage in active caregiving. Social policies are beginning to follow the social climate, albeit not fully and in small steps; numerous countries have introduced paid paternity leave, corporate policies to working dads are gradually improving, and shared custody is becoming a more common practice with the recognition that children need their father’s presence for healthy development (Schober, 2014, 2015; Steinbach, 2019). Fathers of the 21<sup>st</sup> century are sensitive and attend to all facets of childcare and this is the model to which young men are socialized; the involved dad for whom parenting is a core component of his self-concept.

Research, on the other hand, has lagged behind these rapid social changes. While it is clear that infants in the 21<sup>st</sup> century are reared by a different sort of dad than their parents, most current knowledge on parenting and child outcome is still based on studies of the mother-child relationship. Particularly missing are longitudinal studies that include observations of father-child interactions and those spanning long developmental epochs are extremely rare. Research on the biological basis of paternal caregiving or imaging the human paternal brain is only beginning to chart the neuroscience of fatherhood (Feldman et al., 2019). It has become apparent that without rigorous, biobehavioral, and longitudinal research, we will not be able to untangle whether mothering and fathering impact children via similar mechanisms related to parental sensitivity, warmth, and responsiveness and having a double dose of such provisions offers a greater shield than the sum of their individual parts, suggesting that fathers function mainly as a “second parent,” or whether, conversely, maternal and paternal caregiving operate through distinct pathways (Lamb, 2010). Similarly, we are currently unable to determine whether the balance between maternal and paternal contributions undergoes change as children mature and while, for instance, maternal behavior may be more critical during infancy, the father’s style becomes more central in later childhood or adolescence. Very little systematic research tested the effects of father absence – whether full or partial, prolonged or momentary – on children’s resilience at different stages of development. Finally, the effects of the coparental alliance on children’s resilience is relatively unknown. Considering that every third marriage in the United States ends in a divorce (National Center for Health Statistic, 2022), the impact of the mother-father relationship at various family constellations on children’s adaptation is an area in need of much further research.

Another important lacuna in fatherhood research relates to its embeddedness in the cultural context. While fatherhood stands at the crossroad of biology and culture, the scarcity of cross-cultural studies limits our ability to suggest universality of process. The increase in father involvement has mainly been reported in more affluent societies (Schober, 2015), and little systematic data are available from low and middle income countries that typically maintain a more traditional family structure (Bornstein et al., 2016). Societies differ not only in the amount and type of paternal caregiving, but the unique contribution of fathers to children’s resilience may ride on different mechanisms in societies of different resources, social structures, or individualistic versus

collectivistic philosophies. For instance, the pathways leading from paternal caregiving or father absence to child attachment, generosity, social risk, externalizing and internalizing symptoms, achievement, or law breaking is different in American Black families (Tyrell & Masten, 2022), American Muslim families (Aroian et al., 2016), American Mexican families (Tyrell et al., 2019), Black families in South Africa (Makusha & Richter, 2014), BaYaka fathers in Congo (Boyette et al., 2020), or Palestinian fathers in Ramallah (Feldman & Masalha, 2007). Structural racism, immigration, and marginalization not only impede the construction of a healthy paternal self-image, but also alter the pathways of his potential contribution and tilt the research perspective. Tyrell and Masten (2022) argue that research on Black fathers in the United States has mainly adopted a risk/deficit perspective rather than focusing on the positive effects of the father-child relationship, indicating that any discussion on father contribution to child resilience is currently limited in both empirical data and conceptual models and requires constant updating.

On the background of such massive social changes – fatherhood is perhaps the most rapidly changing role in the history of the human family – and the scant empirical data, the discussion on father contribution to child resilience must begin with a solid theory and proceed with caution. The current discussion will be guided by our conceptual model on resilience (Feldman, 2020, 2021b, 2021a) and focus primarily on our own research and studies in Western societies, with fewer studies from other cultural contexts, and thus, the paper presents a limited angle on the topic. Our model on resilience attempts to provide a “positive” definition to the construct that is not built on the negation (i.e., absence of symptoms in the aftermath of trauma or hardship) and is informed by findings in social and affiliative neuroscience. The model considers the fundamental condition of mammals, whose brain matures in the context of the mother’s body and caregiving behavior, and suggests that all systems that sustain resilience, endurance, social fitness, and adaptation to ecological conditions mature in mammals in the context of parental care, particularly those that enable stress management, affiliation, and social adaptation (Feldman, 2020, 2021a, 2021b); hence, the systems that underpin parental care are also those that sustain resilience. Resilience, according to our model, is an attribute of the individual that comprises three core components; plasticity, sociality, and meaning that define the way he or she interfaces with the world and manages its hardships toward personal goals within a matrix of social connections and subjective values. Importantly, while the “plasticity” component of our model applies to all living organisms (maintaining equilibrium, finding novel ways to exist in harsh ecologies or overcome insults) and the “sociality” component relates to mammals (bonding-related biology and species-typical behavior that support exclusive bonds and social group living), the “meaning” dimension is not only human-specific (overcoming hardship through personal, cultural, or religious belief systems and acts of kindness that transcend the life of an individual) but also integrates and molds the “plasticity” and “sociality” components toward their human-specific definitions. Hence, human plasticity marks an inner experience of initiative, agency, mastery, and curiosity contained by boundaries and balance; the ability to flexibly adapt to challenges; and the capacity to find creative solutions to life’s hardships and utilize goal-directed behavior with perseverance and stamina. Such human-specific plasticity is encapsulated within the individual’s life-with-others and is deeply embedded in a rich net of social connections of intimate bonds, larger families, and physical or metaphorical communities who share habits,

behaviors, customs, interests, beliefs, or institutions, thereby defining the human-specific form of “sociality.”

Three points are important to consider with regards to our model on resilience and the father’s role in supporting it. First, while adapting the notion that resilience is defined as a dynamic system that integrates multiple levels and is scalable across levels (Folke, 2016; Masten et al., 2021; Panter-Brick & Leckman, 2013; Van Breda, 2018), we suggest that human resilience is an attribute of the *individual*. This view is informed by Wittgenstein’s argument that; “*Only of a human being and what resembles (behaves like) a living human being can one say; it has sensations; it sees, is blind; hears, is deaf; is conscious or unconscious*” (1958, p.281) and Bennett et al. (2007) claim that psychological attributes can only be ascribed to the whole human. Just as it is impossible, according to their view, to say that “the brain sees,” we can only suggest that an *individual* is resilient, not a system. Human systems (e.g., families, neighborhoods, communities) are resilient only when *individuals* feel committed to the overarching system, form reciprocal social connections within it, imbue the system with meaning and value, and strive to preserve it in flexible, non-obligatory ways.

Second, while most writers (Cicchetti, 2013; Feder et al., 2019; Luthar et al., 2015; Masten, 2007) maintain that resilience implies, by definition, an adaptive response to trauma, vulnerability, or harsh rearing conditions, we suggest that resilience is applicable to *any* life. Every life entails struggles, setbacks, challenges, fears, and losses, and even the average “good enough” environment fails children in multiple ways. Resilience indexes the way the individual interfaces with its world, and, naturally, when conditions are harsher and resources are scarcer, particularly during sensitive periods of brain maturation, more of that attribute is required to overcome the difficulty.

Finally, consistent with Rutter (2013), VanMeter and Cicchetti (2020), and Masten et al., (2021), we suggest that resilience is an emergent attribute. As such, time is an indispensable aspect of resilience and models on resilience must consider “development” across both animal evolution and the lives of humans. Children, like young mammals, develop resilience in the context of parental care, and thus, the discussion on father contribution to resilience must address the continuum of development from birth to adulthood and the father’s specific role at each developmental node.

In the following, I present the three tenets of resilience proposed by our model – plasticity, sociality, and meaning – from a developmental perspective (Feldman, 2020, 2021a, 2021b) and the general presentation is followed by a focus on the father-specific contributions to each tenet. Next, I discuss father-specific components that support resilience at each stage of development; newborn, infant, toddler/preschooler, child, and adolescent/adult. The final part briefly highlights potential dangers in the paternal caregiving style to child resilience.

### The three tenets of resilience and the father-specific contribution

Figure 1 presents our overall model, including the three tenets of resilience viewed from a developmental perspective and the father’s contribution to each tenet of resilience.

#### The three tenets of resilience

*Plasticity*, our first tenet of resilience, applies to all living matter – from bacteria to humans – and taps the capacity to bounce back from major hardships or minor hassles, find novel solutions to

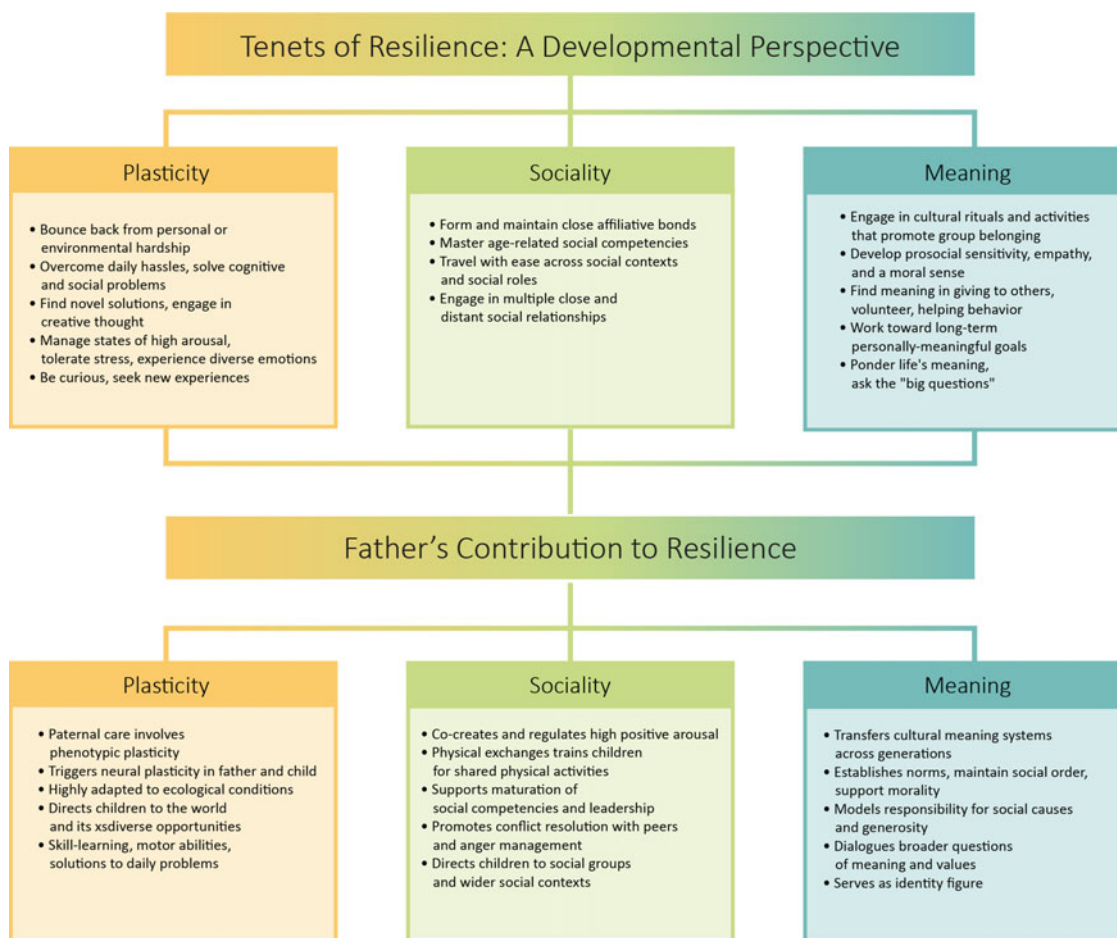
simple or complex problems, and manage high levels of stress or episodes of negative or positive arousal. In addition to the toolbox that helps individuals manage moments of intensity, stress, or difficulty, plasticity also refers to the ability to adopt a curious approach that opens the door, and perhaps actively seeks a multitude of experiences and emotions and the expansion of intellectual and affective horizons. Plasticity, therefore, includes the capacity to get out of one’s comfort zone and foster an adventurous attitude tempered by the ability to wisely plan and sensibly recalibrate.

Developmentally, plasticity has a temperamental component and some infants are better able to shift perspective, manage intensity, and expand their world through curiosity and these traits appear early and are stable over time albeit being molded by the environment, features that make plasticity qualify for the definition of “temperament” (Kagan et al., 2018). It is also clear that the abilities, strategies, and proclivities that fall under the umbrella of “plasticity” undergo significant development across childhood and adolescence and become more complex, verbal, future-oriented, and diversified, with children using skills enabled by brain maturation to enhance plasticity of response. The developmental literature, however, divides research on “plasticity” into several sub-domains and rarely treats the construct as a whole. There is research on “emotion regulation” as part of the social-emotional branch (Feldman, 2009, 2015a; Gross, 2015), which covers some of the general abilities related to plasticity, and research on executive functions and cognitive flexibility (Dajani & Uddin, 2015; Diamond, 2013) which covers others; however, topics such as “curiosity” or the capacity to open oneself to a wide range of thoughts, emotions, and motor activities received little systematic research. Our focus on plasticity as the first component of resilience underscores the need to study plasticity as a unified construct that expresses across domains and indexes a unique dimension in mental health and psychopathology.

Importantly, the “plasticity” component of our model is not synonymous to constructs such as “openness to experience” (McCrae & Sutin, 2009) or “sensitivity to context” (Ellis & Boyce, 2008; Ellis et al., 2011), which contain both positive and negative potentials. For instance, preschoolers “openness to experience” has been shown to predict greater internalizing symptoms in adolescence, particularly in girls (Gjerde & Cardilla, 2009), and sensitivity to context involves both increased ability to grow from enriched environments and greater vulnerability to contextual hazards (Belsky et al., 2007). The focus here is on “plasticity in the service of resilience,” which marks the child’s ability to flexibly discover and utilize environmental provisions for personal growth. In some ways, it echoes the psychoanalytic writing on “primary processes” in creative artists versus psychiatric patients, where the first can be highly sensitive to the unformed richness of such processes but also have enough ego strength to utilize them for creative and communicable production (Kris, 1967).

#### Sociality

The sociality component in our model targets the biological, behavioral, and, in humans, also mental aspects of mammalian social bonds. Sociality describes the neurobiological underpinnings of social life in young who develop within the mother’s body (viviparity) and require proximity to the mother’s body and caregiving behavior for maturation of systems that enable the management of stress and adaptation to social living. Hence, our sociality component considers the biological and relational markers of bonding as the springboard from which infants enter into social groups and posits continuity from the parent-infant bond to other affiliative



**Figure 1.** The three tenets of resilience and the father contribution.

relationships and general social competencies that mature throughout life (Feldman, 2021a).

Sociality, like plasticity, develops from infancy to adulthood across three continua. The first considers the mother-child relationships from infancy to adulthood, which begins with the synchrony of non-verbal cues, such as mutual gaze, co-vocalization, or joint affective expression, and expands over time as symbolic, imaginary, empathic, and verbal abilities develop, culminating in the mother-child adult-to-adult relationship of mutuality, respect, and autonomy that still retains the initial non-verbal rhythms (Feldman, 2021a). Such synchrony is individually stable from infancy to adulthood and shapes the maturation of the social brain in young adulthood (Feldman, 2010; Pratt et al., 2019; Ulmer-Yaniv et al., 2021; Yirmiya et al., 2020). The second line addresses the expansion of the neurobiology of attachment and its behavioral repertoire from the mother-infant bond to other affiliations; with fathers, close friends, mentors, romantic partners, and, eventually, with the child's own children, charting the cross-generational arc of attachment. Finally, the third line describes the pathway from early maternal and paternal caregiving to life within social groups and to abilities that enable individuals to manage life in human societies; collaboration, empathy, conflict resolution, theory-of-mind, and social participation, all of which are longitudinally predicted by parent-infant synchrony (Feldman, 2021a). Here, we focus on the father-child relationship from birth to adulthood and its contribution to children's social skills within society-at-

large and discuss how, while built on the same neurobiological systems and social synchrony as maternal care, fathering charts a distinct pathway to resilience. Since most forms of psychopathology, particularly those of a childhood onset, are marked by social dysfunction, understanding how the father's unique style contributes to the "sociality" component of resilience is an important topic for prevention and intervention science.

### Meaning

In contrast to the plasticity and sociality tenets, the meaning dimension of resilience is human-specific. It describes the ability to meet life's challenges, overcome hardship, and bounce back from trauma through strengthening personal values, meaning systems, cultural narratives, and acts of kindness. These typically involve compassion and generosity, both concrete and figurative, and generate giving to others in ways that extend the life of the individual, connect the distant past with the far-away future, and activate compassion to self and others. Humans can use trauma to re-define their meaning systems, re-focus life on authentic goals, and specify in greater precision what matters to them, allowing meaning to bestow resilience in the face of trauma.

Developmental research has rarely addressed the development of the child's sense of meaning across childhood. This is despite the fact that meaning and related constructs, such as purpose, faith, or spirituality have been described in numerous models on resilience



as protective factors (Masten & Motti-Stefanidi, 2020; Masten & Wright, 2010; Werner, 2012). Cultural meaning systems are sifted into the earliest interactions between parents and children; for instance, overarching philosophies on the self and its embeddedness in social groups (e.g., individualism versus collectivism; Kitayama, 2002) determine whether adults and infants are allowed (or encouraged) to be in direct eye contact beginning in the first months of life. Still, the child's ability to employ "meaning," whether collective or private, to overcome hardship has rarely been addressed in developmental research. Children's participation in cultural rituals is critical for the enhancement of resilience and fosters a sense of belonging, and child participation in cultural activities increases with age across all human societies. The concept of "guided participation" (Rogoff, 2008), built on Vygotsky's notion of the "zone of proximal development" (Moll & Tomasello, 2007), describes how children enter into cultural activities from a young age in ways that are suited to their developmental stage and how these modes of participation are transferred across generations through scaffolding, modeling, and apprenticeship by skilled adults. Such guided participation enables not only the acquisition of skills but also promotes a sense of competence, belonging, sharing, and cultural meaning. For instance, the transition to adolescence and the new status as an adult member of society is typically accompanied by ritualized acts that aim to enhance the sense of meaning, personal strength, and resilience. Similarly, volunteer work is often a resilient-promoting experience for youth that may get adolescents out of their self-absorption through acts of kindness, but little research addressed its specific impact on youth, particularly at-risk youth (Ockenden & Stuart, 2014). Finally, engaging in "serious" questions that contemplate the meaning of life is a feature of adolescence that may carry resilience-promoting benefits when it is conducted under guidance and within affiliative bonds. Fathers play a key role in the generation-to-generation transfer of philosophies, meaning systems, religious beliefs, cultural rituals, and metaphysical understanding of the world and its meanings and such meaning-making discussions may chart one pathway for the father-specific contribution to resilience.

Finally, combinations of the three tenets: plasticity, sociality, and meaning, are important to consider in the discussion on resilience. For instance, the *plasticity/sociality* combination considers the child's ability to move with ease from being alone to engaging in one-on-one encounters to participation in whole-group activities, adapt flexibly to the role of leader as well as to that of participant or follower, enjoy a variety of social contacts from intimate bonds to casual relationships, and regulate emotions in social contexts. The *sociality/meaning* combination describes the capacity to gain meaning from personal relationships, grow from giving to others, and find satisfaction in the sharing of cultural activities and rituals. Finally, the *plasticity/meaning* combination is critical to allow meaning systems to remain personal, open, and flexible rather than turn into a rigid set of imposed rules and oppressive surveillance, the risk run by some forms of organized religion.

### *Father contribution to plasticity, sociality, and meaning*

#### *Fatherhood and plasticity*

Fatherhood is a rare phenomenon in mammals, who require immense maternal investment for internal gestation and postnatal development, and the question then becomes what is the added benefits to offspring survival afforded by paternal caregiving to justify the additional energy (Braun & Champagne, 2014; Feldman,

2015b, 2016; Feldman et al., 2019). Bi-parental rearing in mammals occurs in only 3–5% of mammalian species and in these species fathering is facultative, that is, occurs in the context of maternal care (Geary, 2000; Kleiman, 1977). Social monogamy, although not necessitating full sexual exclusivity involves shared rearing of the young and the creation of family units (Lukas & Clutton-Brock, 2013). While the ontogeny of social monogamy is not fully clear – it is observed in several unrelated lineages of species, including in rodents: prairie vole (*Microtus ochrogaster*), mandarin vole (*Lasiopodomys mandarinus*), degu (*Octodon degus*), California mouse (*Peromyscus californicus*), Campbell's dwarf hamster (*Phodopus campbelli*) and mongolian gerbil (*Meriones unguiculatus*), and in primates some lemur species, New World marmosets, tamarins, titi monkeys, and owl monkeys – the emergence of social monogamy enabled greater plasticity in the parental roles. Furthermore, social monogamy has led to the highly flexible neurobiology of paternal caregiving (Abraham et al., 2014; Feldman, 2015b; Horrell et al., 2018; Rosenbaum & Gettler, 2018; Saltzman & Ziegler, 2014), which, in turn, induces neural, hormonal, and behavioral plasticity in the offspring (Abraham & Feldman, 2022). Hormones that underpin maternal care, such as oxytocin and prolactin, which operate through evolutionary-conserved mechanisms, are similarly activated in fathers but in ways that are less obligatory and causal and in response to ongoing exposure to mother and infant (Bales & Saltzman, 2016; Feldman, 2019). Cortisol activates in new fathers in response to infant cries and signals for care (Storey et al., 2000) and testosterone, which is associated with aggression, status, and mate selection, decreases at the transition to fatherhood in coordination with the degree of father involvement (Gettler et al., 2014; Gettler, McDade, Feranil, et al., 2011; Nunes et al., 2001). It has been further shown that extended exposure to pups activates hormonal and neural paternal response (Bales & Saltzman, 2016; Horrell et al., 2017), highlighting the link between the degree of father involvement and alterations in the father's neurobiological response. Similarly, activation of oxytocin neural pathways triggers parenting behaviors in otherwise infanticide naïve mice and such activation can result from repeated exposure to unfamiliar pups (Horrell et al., 2017; Inada et al., 2022). These features define the highly flexible neurobiology of fatherhood. Studies have indicated that the biology of fatherhood shows not only high variability among species but also marked differences between individuals within each species (Horrell et al., 2018), creating bottom-up, behavior-based pathways in which parenting-related hormones and neural networks are triggered by exposure to infant stimuli and active caregiving (Abraham & Feldman, 2022).

Recently, the microbiome and the gut-brain axis have been suggested as a novel biological story of fatherhood and its effects on plasticity. It has been postulated that the evolution of paternal investment, particularly under conditions of paternity uncertainty, may build on microbiome-host relations (Gurevich et al., 2020). Using computational modeling, Gurevich et al. (2020) conclude that host-microbiome interactions that promote caregiving may be favored by evolution to create ecological niches that contain opportunities for father-offspring microbiome transfer, such as during grooming or feeding. This opens an entirely new avenue of plasticity for the evolution of paternal caregiving, and similarly highlights the behavior-based underpinnings of the biology of fatherhood.

Humans are not inherently bi-parental: human infants can reach sexual and social maturity without paternal caregiving. Still, the brain basis of fatherhood flexibly organizes in response

to the amount of caregiving, charting a behavior-based mechanism to the consolidation of the paternal brain (Abraham & Feldman, 2022). We found that the amygdala activated four times more in mothers as compared to fathers, whereas cortical mentalizing networks were three-fold more active in fathers, suggesting a more ancient obligatory pathway to maternal caregiving alongside a more top-down pathway to fatherhood. However, when fathers were the primary caregivers in families of two gay men with no maternal involvement since birth, fathers' amygdala activation was similar to that of mothers and was underpinned by functional connectivity between the amygdala and mentalizing structures (Abraham et al., 2014). Among all fathers, primary and secondary, the time father spent alone with the child was related to the degree of connectivity between the amygdala and mentalizing structures, indicating that neural plasticity and reorganization of the paternal brain are molded by active caregiving. The degree of coherence in the parenting-related networks of the father's brain in infancy, implying neural plasticity, predicted greater behavioral plasticity in the children during preschool as indexed by better emotion regulation, management of positive arousal, higher oxytocin reactivity to social interactions, and more flexible cortisol response. At 6–7 years, children of fathers who showed greater brain reorganization at the transition to parenthood displayed less internalizing problems (Abraham et al., 2016, 2017, 2018), underscoring the importance of father brain plasticity for the development of children's well-being and adaptation.

Are the greater variability and behavior-based plasticity of the neurobiology of fatherhood universal? We currently do not have a clear answer. Studies on the paternal brain have mainly been conducted in more affluent cultures, including the United States (Kim et al., 2014; Kuo et al., 2012; Marshall et al., 2022; Rilling & Mascaro, 2017), the Netherlands (van't Veer et al., 2019), Germany (Wittfoth-Schardt et al., 2012), Israel (Abraham et al., 2014; Atzil et al., 2012), and Japan (Diaz-Rojas et al., 2023), and show similarities in activation patterns, but studies in developing countries have not been conducted. With regards to hormonal changes, research in both the Philippines (Gettler, McDade, Feranil, et al., 2011), and Western countries (Corpuz et al., 2021; Gordon et al., 2017) show decline in testosterone at the transition to fatherhood that correlates with the degree of father involvement, suggesting the possibility for a universal phenomenon.

The greater plasticity and wider variability of the neurobiology of fatherhood are also observed at the behavioral level. Cross-cultural studies indicate that while the role of mothers has been relatively uniform throughout history and is consistent across cultural communities, fatherhood expresses in a wide range of formats, ranging from fathers who take very little interest in their children, especially in infancy, to primary caregiving fathers (LeVine, 1988; Rosenbaum & Gettler, 2018; B. H. Schneider, 1998; Super & Harkness, 1997). Phenotypic variability implies not only the amount of time fathers spend with their children but also the range of childcare responsibilities they perform, the degree of hierarchy and "distance" between father and child, and the age when father "meets" the child and starts an ongoing relationship, all of which show vast cultural differences. These highly variable conditions may shape vastly different neural and endocrine response in both father and child. Another important aspect of cultural divergence relates to the inherent "paternity uncertainty" of mammals and to the centrality a culture attributes to the father-child genetic linkage. Such emphasis may lead to greater distance between father and child or to the special role played by the mother's brother (Milanich, 2019). It is thus possible that the shift in emphasis from

genetics to caregiving in the definition of fatherhood may contribute to the greater plasticity seen in studies on the paternal brain in societies with increasing levels of father involvement.

Fathering enhances plasticity in human children in multiple ways. Fathers are often the parent that challenges children, invites them to step out of their comfort zone, introduces novelty, and teaches daily living skills. Traditionally, fathers have been invested in strengthening the child's physical stamina and in building moral character and their parenting has focused more on supporting the child's involvement with the external world and its surprises, as compared to the mother-child relationship which orients inwardly to the dyad (Feldman, 2003; Feldman et al., 2019). Such guided experiences with the physical and social environment allow children to meet challenges with greater flexibility, consider multiple options, and build resilience in age-appropriate manner. Fathering often involves skill-learning, motor abilities, and practical solutions to daily dilemmas and these father-child experiences sharpen the plasticity component of resilience. Finally, fathers may be the parent to whom adolescents turn for abstract or more "philosophical" discussions that enhance conceptual thinking and deepen the child's engagement in broad political, social, or ethical issues, leading to the expansion of the child's mental world and enhancing flexibility. Still, while these orientations and behaviors may be more characteristic of the father-child relationship, they can be observed in the relationship with mother or other benevolent adults. It is also possible that the father's greater distance from the family's daily chores creates more opportunities for abstract conversations. With the blurring of the traditional parental roles, the specific "maternal" and "paternal" styles may become more flexible, and each can be assumed by mother or father pending individual preferences, family constellations, and cultural customs.

#### *Fatherhood and sociality*

The father's presence, even without his specific social repertoire and its unique benefits, is sufficient to enhance social competencies in young mammals (Bambico et al., 2015; Bester-Meredith & Marler, 2003; Cao et al., 2014; McGraw & Young, 2010; Wang et al., 2012; Yu et al., 2012). It has been suggested that the evolution of bi-parental rearing and the formation of family units accelerated the maturation of complex social behaviors, possibly due to the availability of multiple sources of parenting that allow young to form several viewpoints on social events and adopt flexible strategies. A study on mentalization and shared representations in several primate species showed that marmosets outperformed capuchin monkeys and Tonkean macaques, and that this superior performance was unrelated to general social skills or inhibitory control. Since marmosets were the only bi-parentally reared subjects among the tested species, the authors concluded that the additional parental figure, the father's facultative childrearing, enabled marmosets to develop theory-of-mind skills that mature through both the experience of multiple caregiving and the observation of exchanges between parents (Miss et al., 2022).

The findings in marmosets echo theories on child socialization beginning in the 1970s (B. Schneider et al., 1989), which suggest that children master social skills and cognitions via two types of mechanisms: participation and observation, the first describing the direct relationship with each parent, the second considers the lessons learned from observing the interactions between parents. The integration of the two supports the development of a richer sociality that contains multiple relationships and their complex net of interactions within the family system. Infants recognize moment-by-moment patterns of social synchrony between their parents beginning at four

months of age and alter the interactive partner within seconds of reading mother-father cues, for instance, when one parent transfers the lead role to the other (Gordon & Feldman, 2008). Systemic family models describe young children's sensitivity to myriad family relationships; individual-to-individual, individual-to-dyadic, dyadic-to-dyadic, individual-to-triadic, and dyadic-to-triadic (Cowan & Cowan, 1992) and research shows that sensitive fathering is related to a more coherent and harmonious family process even in the absence of sensitive mothering, for instance, when mothers are depressed (Vakrat et al., 2018). This is also consistent with the psychoanalytically based model of Daniel Stern presented in *The motherhood constellation* (1995), which suggests that the transactions of non-verbal cues between mother and infant provide the foundation for the infant's emerging attachment representations and inclusion of the father, in terms of both his parent-child and spousal behavior and representations, enriches the child's growing representations of sociality.

In addition to the father's presence as a third relational figure, studies that pinpoint the father's distinct interactive style highlight its unique contribution to resilience. In infancy, interactions with fathers are more exciting and novel and contain quick peaks of positive arousal that appear at random within a tightly coordinated father-child play (Feldman, 2003). This allows infants to build and regulate high positive arousal, prepares infants to novelty in the context of ongoing social relationships, and affords a more exciting and unpredictable social experience that differs from the more stable rhythms created with mother. Fathers direct infants' attention not to face-to-face communication, as mothers do, but to the environment and prefer exploratory to social play. These two styles; "social" and "exploratory" (Bornstein, 2019) are distinctly linked with maternal and paternal oxytocin and vasopressin (Apter-Levi et al., 2014), sensitizing a somewhat different neuroendocrine basis of sociality in the child. Father's social style contains more physical, "rough-and-tumble" exchanges, particularly with boys (Flanders et al., 2009; Stgeorge & Freeman, 2017), and this prepares children for active engagement with the physical and social environment. This energetic paternal style supports preschoolers' capacity to manage anger in social contexts and their ability to dialogue differences with greater reciprocity and social skill (Feldman et al., 2013).

While not all cultures encourage face-to-face synchrony, the father's style across cultures is still more arousing and physical compared to the maternal style. Our research on Palestinian families in Ramallah shows that interactions with both parents in infancy were based on touch rather than facial cues; however, father-child interactions were quicker, more physical, and more outward-directed compared to mothers. In preschool, fathers exerted more control and had more expectations for cognitive performance. However, more responsive fathering in the culture-specific format linked with better child sociality, including greater regulatory skills, higher social competence at kindergarten, and better management of aggression with peers, suggesting universality in the associations between sensitive fathering and child sociality (Feldman et al., 2001; Feldman, Masalha, et al., 2010; Feldman & Masalha, 2010).

The specific repertoire of the father's relational style and its maturation from infancy to adulthood is described in the following section; still, the overall trajectory of the paternal style makes a unique contribution to child sociality. Father's relational behavior opens children's sociality to active engagement, joint exploration, high-energy friendships, and modulated risk-taking; boosts activity, agency, and collaboration in social contexts; and provides an

exploration-directed social focus in the child's future relationships. This is in comparison with the maternal style, which is more predictable, focused on reading and responding to interpersonal social signals, and sustains the child's search for a secure base and sense of safety in future affiliative bonds.

### *Fatherhood and meaning*

The meaning dimension of resilience has long been associated with the "father," both the real father and the metaphorical one. In many religions, "father" serves as a symbol for God and the "elders" (e.g., monk, priest, Muslim qadi, rabbi), carry a "paternal" function that promotes resilience through guidance, leadership, and material and spiritual assistance. There are resilience-promoting components in organized religion, particularly those related to the sense of community and social support, the practice of ritual that often takes place within religious traditions and shared sacred experiences (Schwalm et al., 2022), and the availability of scriptures that enable individuals to view God or religious leaders as benevolent attachment figures (Cherniak et al., 2021). However, as women, at least in some cultures, are increasingly assuming the role of spiritual leaders, the equation of spiritual guidance with the metaphorical "father" is likely to diminish.

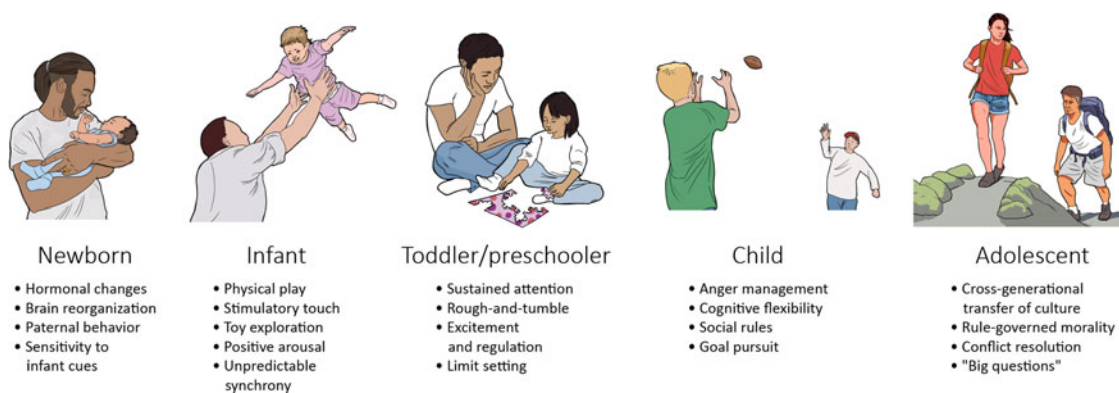
Apart from "elders" that connect individuals with a sense of meaning, fathers often serve as the main agents for the cross-generational transfer of ideas, meaning systems, beliefs, and social practices that build the child's internal values and form the sense of belonging to a larger circle of family, community, and culture. Fathers play an important role, in ways that are distinct from those of mothers, in instilling morality, empathic understanding of others, the establishment of fair norms of conduct, and the need for cooperation and giving. Father represents the laws of the family, culture, and society; epitomizes the rules of social conduct with fellow-citizens; and helps children master self-regulated sociality, anger management, and the ability to handle conflict with respect and perspective-taking. These abilities extend the child's focus beyond the self and toward the well-being of others, enhancing the "meaning" dimension of resilience.

Besides acts of kindness and generosity, older children and adolescents may engage with fathers in conversations that ponder the "big questions" of life, consider hypothetical solutions, and zoom out of the child's immediate context into a larger vision on the meaning of life. While deep discussions are certainly not limited to the relationship with father and children can engage in meaningful conversations with friends or other adults (such as grandparents, teachers, or mentors), the father's greater distance from the day-by-day hassles of caregiving, which is still found even in egalitarian households (Craig, 2006), facilitates a dialogue characterized by greater conceptual distance, and adults who received positive fathering often reflect fondly on the conversations they had with their fathers and the opportunity these moments afforded to explore social, political, or ethical issues in ways that shaped their lifetime ideologies. In expanding the scope of children's interests, sharpening cognition, tuning affect regulation, supporting their inquisitive mind, and accompanying the search for personal identity, fathers can uniquely support the child's sense of meaning, enhancing the human-specific dimension of resilience.

### **Father's relational behavior from infancy to adulthood and child resilience**

Like the mother-child relationship, fathering is an evolved process that matures over time along a distinct trajectory. The





**Figure 2.** Father contribution to child resilience across developmental stages.

aforementioned features of high arousal, physicality, anger management, guided participation in daily living skills, adventure, exploration, and abstract expansion, typical of the paternal style, appear in distinct ways at each developmental stage. Like mothers, fathers may be more or less adept at relating to children of a particular stage and while some fathers may take great pleasure in playing “rough-and-tumble” games with their toddlers in the park, others may be less physically skilled and may be better at initiating deep conversations with their adolescents. We discuss typical milestones in the father-specific parenting from newborn to adulthood along the father’s unique support of plasticity, sociality, and meaning. This developmental progress of the father-specific resilience-promoting style is presented in Figure 2.

### Newborn

Hormonal changes have been detected in human fathers at the period surrounding the birth of their infants and during the first weeks of parenting in response to infant cry, physical contact, or father-newborn interactions, as seen in increases in cortisol (Kuo et al., 2018), prolactin (Fleming et al., 2002; Gordon et al., 2010c), and oxytocin (Gordon et al., 2010b). Comparable hormonal changes have been shown in bi-parental mammalian fathers (Bales & Saltzman, 2016) and, similar to other mammals, alterations in the father’s neuroendocrine response occur hand-in-hand with the amount and intensity of caregiving and exposure to infant stimuli (Gettler, McDade, Agustin, et al., 2011; Gordon et al., 2010c, 2010a; Gray et al., 2007; Storey et al., 2011).

Several studies also showed changes in fathers’ brain at the transition to parenthood (P. Kim et al., 2014; Martínez-García et al., 2022; Paternina-Die et al., 2020). These included both structural changes, as observed in increased gray matter volume in the hypothalamus, amygdala, striatum, and lateral prefrontal cortex and decreased gray matter volume in orbitofrontal cortex, posterior cingulate cortex, and insula during the first 4 months postpartum (P. Kim et al., 2014). Gray matter reduction has also been found in two cohorts of fathers imaged before or during pregnancy and after the birth of their first child (at 2 or 7–9 months) and pointed to decreases within the default mode and visual networks (Martínez-García et al., 2022).

Changes associated with childbirth have also been observed in the father’s propensity for depression, with studies showing postpartum depression in new fathers (Ansari et al., 2021; Eddy et al., 2019; Paulson & Bazemore, 2010), heightened mental preoccupations regarding infant safety and distress signals, and reorganization of mental life to make room for the infant and the new

attachment relationship (Leckman et al., 2004, 2007). Similarly, new fathers show increased sensitivity to infant cry, both their own and general infant cry sounds, as reflected in neural, hormonal, and behavioral response (Fleming et al., 2002; Swain et al., 2004). Studies on the transition to parenthood also highlight the father’s increased focus on providing for the family and protecting mother and child and this tendency is observed in cultures of vastly different approaches to family roles and childrearing practices (Feldman et al., 2001). These changes support the plasticity of the neurobiology of fathering, its focus on sociality, and the reorganization of mental life to imbue the father’s parenting with meaning.

Still, while fathers undergo massive neuronal, endocrine, behavioral, and mental changes at the transition to fatherhood, such changes in fathers, unlike those that accompany the transition to motherhood, do not simply result from childbirth or lactation but flexibly organize from exposure to mother (both before and after childbirth) and infant, mental preoccupations with the infant’s well-being and safety, centrality of the paternal role to the man’s sense of self, and active involvement in caregiving. Fathers, it appears, are biologically prepared for parenting, and data on this point contradict notions that were prevalent until recent human history, but their preparedness is effort-based and not automatic. Fathers must work hard to become “biologically prepared” and make room, both biologically and mentally, for the infant in their lives; else, fatherhood will pass them by (Feldman et al., 2019; Rilling & Mascaró, 2017; Rogers & Bales, 2019).

### Infant

The reorganization of the “parental caregiving network” in the brain of new fathers takes place during the infant’s first months of life (Feldman, 2015b). The paternal network resembles, in the main, the network formed in the brain of mothers but slight differences chart a more evolutionary-ancient pathway to motherhood versus a more top-down cortical pathway to fatherhood. These neural changes consolidate hand-in-hand with the amount of caregiving responsibilities and level of sensitive parenting (Abraham et al., 2014, 2018; Marshall et al., 2022). In addition, hormones of parenting, such as prolactin, oxytocin, and vasopressin become tied with the “paternal” relational style that contains more stimulatory touch, as compared to the affectionate touch of mothers, exploratory behavior, and attention to objects rather than faces during play (Apter-Levi et al., 2014; Gordon et al., 2010c). During the first months of parenting, the father’s behavior becomes



coupled with biology; we found that the amount of stimulatory touch during father-child play at 4–6 months determines the degree of increase in paternal oxytocin following the interaction, linking the father-specific touch with the neurobiological system that underpins bonding (Feldman, Gordon, Schneiderman, et al., 2010a). Several studies, including a large population-based study in the Philippines, showed that fathers' testosterone decreases from pre-pregnancy to the first months of parenting and the decrease is related to the amount of father involvement with the child (Gettler et al., 2011; Kuo et al., 2018; Perini et al., 2012; Saxbe et al., 2017). Other studies that measured fathers' testosterone during the child's first months point to associations between low testosterone in new fathers and more parenting behavior during social interactions, as well as to complex associations between testosterone and oxytocin (Gordon et al., 2017; Weisman et al., 2014). Infancy, therefore, is a period of reorganization for the father's neuroendocrine profile that provides the basis for a long-term father-infant attachment and consolidation of the paternal role.

Alterations in the father's hormones in infancy shape, in turn, the child's neuroendocrine response, enhancing the "plasticity-by-affiliation" biobehavioral mechanism that sustains resilience in contexts of harsh rearing environments (Yirmiya et al., 2020). For instance, we found that after synchronous interactions between fathers and their 4–6 month old infants, but not after non-synchronous interactions, there is a coordinated release of oxytocin in father and child (Feldman, Gordon, & Zagoory-Sharon, 2010). Similarly, oxytocin administration to parent increased not only the father's oxytocin levels but also the infant's oxytocin and these increases linked with the greater paternal touch and infant exploration that were expressed under oxytocin (Weisman et al., 2012). Oxytocin administration also modulated the father's cortisol (Weisman et al., 2013) and testosterone (Weisman et al., 2014) hand-in-hand with the increase in father and child's positive social behavior.

Interactions between fathers and infants contain more energized contact, such as stimulatory touch, proprioceptive stimulation, or "throwing in the air" and these sensitize children to relationships that involve physical activity and energetic sociality. In a study that compared infant-mother and infant-father synchrony at 5 months of age, we found that while levels of synchrony were comparable between parents, synchronous play with father focused on the environment, encouraged exploration, and contained quick and random peaks of high positive arousal. During the sensitive period of maturation of the social brain (Feldman, 2016), father-infant interactions prepare the child's brain to draw reward from social moments that contain joint physical activity, high level of energy, stimulatory contact, and outward focus. The greater toy exploration and attention to the environment observed during father-infant interactions (Gordon et al., 2010b) likely play an important role in sensitizing the infant's "mentalizing" temporal and temporoparietal regions, which constitute the core structures of the social brain and undergo maturation during this period in terms of white matter development, neuronal pruning, and brain growth (Lemaître et al., 2021).

Despite research pointing to distinct paternal and maternal styles in terms of concrete social behavior and attention orientation, studies that compare global levels of sensitivity, attunement, and reciprocity in infancy show comparable levels during interactions with mother and father (Bureau et al., 2021; Feldman, 2000, 2007a; Feldman et al., 2001, 2003; Lindstedt et al., 2021). Another important aspect is that the reciprocity infants build with

their father is individually stable from infancy to adolescence and predicts a host of social-emotional and mental health outcomes in preschool, childhood, and adolescence (Abraham et al., 2018; Feldman et al., 2013; Feldman & Masalha, 2010). Finally, behavioral assessments of triadic mother-father-infant interactions show that both parents contribute equally to the formation of a cohesive and harmonious, or, conversely, a rigid and intrusive family style (Feldman, 2007c; Feldman et al., 2001). This suggests that father contribution to resilience, from infancy onward, passes through two types of mechanisms, the first charts a distinct father-related trajectory and the second taps a parent-general pathway by which children gain resilience through warmth, attunement, and reciprocity from each of their parents.

Associations between father involvement and resilience are also observed in low-income societies. In a low resource South Asian context, Maselko and colleagues (2019) tested links between father involvement and child development in 996 families across the first year of life. Father overall engagement and more specific involvement in play and soothing at three months predicted child social-emotional development at six months and motor skills and cognitive development at 1 year, suggesting a universal role for involved fathering.

### *Toddler/Preschooler*

With the onset of toddlerhood, the initiation of language, and the growing expansion of the infant's symbolic world, parent-child play often includes the creation of imaginary scenarios that become more complex, verbal, and imaginative as children grow. Parents scaffold the child's symbolic abilities and the development of symbolization occurs at the "zone of proximal development" through online apprenticeship (Bornstein et al., 1996; Slade, 1987); the greater symbolic scaffolding the parent provides, the higher the level of symbolic complexity the child expresses (Bornstein, 2007; Feldman, 2007b; Fiese, 1990; Marjanovič-Umek et al., 2014). We found that father-child and mother-child interactions at 3 years were comparable in terms of both child symbolic expression and parental scaffolding. However, the temporal organization of the interaction, its "background emotion," differed and each charted a unique dynamic pattern of oscillation between simple functional moments and complex symbolic episodes. The rhythmic move from simple functionality to complex symbolization followed the same pattern observed for the non-verbal synchrony in infancy; more gradual build-up of symbolic moments with mother that slowly decline to functionality as compared with quicker, randomly achieved moments of complex symbolization with father (Feldman, 2007b).

The father-child relationship at this stage enhances the child's emotion regulation, anger management, and self-regulated compliance (Boldt et al., 2020; S. Kim & Kochanska, 2012; Kochanska et al., 2008). We found similar levels of self-regulated compliance, but lower levels of non-compliance and defiance, during a toy pick-up task with mother and father (Feldman & Klein, 2003), indicating that goal-directed interactions with fathers are more rule-governed. Similarly, the reciprocity children formed with father and mother at 5 months was comparable but each predicted a distinct social trajectory; father-infant reciprocity linked with the preschooler's ability to manage anger and curtail aggression in the peer group, and this was found for both Israeli and Palestinian children (Feldman, Masalha, et al., 2010). Among Palestinian preschoolers, father play was more controlling and limit-setting during a complex puzzle task, but, unlike the Israeli

fathers, the increased paternal control was accompanied by positive affect and correlated with child social competencies with friends (Feldman & Masalha, 2010). Fathers play an important role in the development of limit-setting, rule obedience, and consolidation of a moral conduct, behaviors that are mastered during the preschool years and tend to be individually stable throughout life. Studies have shown that father involvement and paternal sensitivity in the toddler years serve as protective factors against aggression and promote social adaptation (Dumont & Paquette, 2013; Opondo et al., 2016). These abilities play an important role in building the resilient profile.

In a study that compared social behavior and emotion regulation during interactions with mother and father among high-functioning preschoolers (3–6 years) with autism spectrum disorders (ASD), as compared to typically developing (TD) preschoolers, we found that both mothers and fathers of ASD preschoolers showed similar levels of sensitivity, intrusiveness, and limit-setting to those displayed by parents of TD children; however, as the child's levels of engagement and compliance were lower in the ASD group and social withdrawal higher, the interaction was less reciprocal and more constricted (Hirschler-Guttenberg et al., 2015). While baseline levels of oxytocin in children with ASD was lower compared to TD preschoolers, the presence of both mother and father normalized these attenuated levels and at the second and third saliva samples (after 20 and 40 minutes with the parent respectively) and no differences were detected between oxytocin levels of ASD and TD children after time spent with mother or father, indicating an “externally regulating” parental function of the oxytocinergic system. Oxytocin levels of both parents and children linked with the amount of synchronized social behavior during play (Feldman et al., 2014). This suggests that mothers and fathers engage in similar levels of global and micro-level social behavior, even when children exhibit marked social difficulties, and that these behavioral patterns carry the same effect on maturation of the child's oxytocin system, even when it is not optimally functional.

Mother-father differences were detected in their co-regulatory behavior during the emotion regulation paradigms and their differential effect on the child's cortisol stress response, particularly in the ASD group. While mothers of children with ASD accommodated their child's difficulties during the emotion regulation paradigms and provided more help and assistance, fathers behavior in the ASD and TD group was similar. It thus appear that fathers of preschoolers with ASD expected the child to find ways to regulate difficult social moments, for instance, during the “still-face” paradigm, and to manage episodes of high negative and positive arousal, as observed in the “masks” and “bubbles” paradigms of the Lab-Tab (Goldsmith & Rothbart, 1996). In the ASD group, mother's, but not father's presence attenuated the child's cortisol response to the “still-face,” indicating that the extra regulation of mothers buffers the child's stress response in a manner similar to that observed in young mammals (Ostfeld-Etzion et al., 2015). These findings pinpoint the differences between mothers and fathers when children encounter difficult emotional moments and indicate that fathers are less accommodating and more demanding. Fathers may place more challenge on the child to push limits, supporting resilience through modeling the need to work hard to overcome hardship.

In addition to the effects of the paternal style on the development of regulation, the “rough-and-tumble” father-child play continues as children's motor skills mature. The father's more challenging style may support cognitive development and

flexibility in unique ways and the paternal style that focuses attention on the outside world coincides with the toddler's or preschooler's emerging curiosity and may help support an attitude of flexibility, problem solving, and excited exploration (Ahnert et al., 2017; Amodia-Bidakowska et al., 2020; Anderson et al., 2017; Carson & Parke, 1996; Freeman & Robinson, 2022; Oryono et al., 2021; Stgeorge & Freeman, 2017).

Father involvement in low-income minority was similarly found to support child development at this stage. A study of 11,473 preschool-aged children in Caribbean countries found that the engagement of both mother and father predicted the child's literacy and social skills (Yildirim & Roopnarine, 2017). In rural low-income Latinos families, Pancsofar and Vernon-Feagans (2006) found that during a shared task, father's, but not mother's vocabulary correlated with language development at 15 and 36 months. Reading habits among Latino fathers were associated with their children's academic achievement (Goldenberg et al., 2005; Ortiz, 2004), and sensitive Latino fathers were five times more likely to have toddlers who showed typical cognitive development compared to low-sensitivity fathers (Shannon et al., 2002; Shears & Robinson, 2005). Attachment security with each parent linked with different outcomes. Portuguese preschoolers who developed a secure attachment with their father, but not with their mother, had more friends (Veríssimo et al., 2011) and preschoolers with secure attachment to their father showed greater peer competence and less internalizing symptoms (Marcus & Mirlé, 1990). Among Chinese preschoolers, high-quality father-child relationship was related to lower aggression, greater peer competence, and higher popularity (Zhang, 2013). These finding highlight the universal contribution of sensitive and involved fathering for the development of children's modulated aggression and social competencies.

### Child

Like the maternal style, which becomes richer, more complex, and mutual as children gain cognitive, social, emotional, and motor skills, the father's style that foster physical play, outward attention, limit-setting, exploration, and the regulation of high arousal continues to expand across childhood along the child's growing abilities. During the 6- to 12-year time-span, children gradually shift their main attachment focus from parents to peers (Mayseless, 2005), and during this shift, abilities learned within the father-child relationship contribute to the child's social competencies in the peer group, particularly the management of anger, the settling of dispute, and the sensitivity to fairness. Observational studies of father-child interaction in school-aged children are relatively rare. One study showed that father-child synchrony observed during playful interactions predicted less behavioral problems in school-aged children and buffered the effects of uncoordinated interaction with the mother (Bureau et al., 2021). Another study observed fathers and first-graders in a semi-structured play and a teaching situation and showed that children whose father was more sensitive displayed lower dysregulation symptoms in third grade (Gregory et al., 2019). A study in Belgium showed that attachment to fathers in middle childhood was related to self-worth and peer acceptance (Verschuere & Marcoen, 2005) and a US study showed associations between quality of the father-child relationship and social competence in schoolchildren (Baker et al., 2011).

During the school years, children model their anger management behavior on that of the father's and retrospective account of adults often link their anger management strategies – whether

dysregulated or overly regulated – with their father’s ability or inability to regulate anger during middle childhood or adolescence. Father’s contribution to children’s empathic cognitions and understanding of others has also been rarely studied in experimental designs; however, along the child’s growing cognitive complexity and empathic cognitions during late childhood and early adolescence, father may serve as an important role model through both concrete behavior and father-child discussions. Also starting at this age is the child’s ability to participate in the father’s leisure activity, and this is often observed in families where the father-child relationship has been set on secure grounds from the start and is resilient-promoting. Children may become involved in the sports their father is invested, begin to enjoy the music the father prefers, join father in hiking or biking activities, accompany father in cultural or religious rituals, and, when available, enjoy tool-use and fix-it activities with father. At this age, fathers can model persistence toward long-term goals, exemplify the value of hard work, and show the reward embedded in hard-won achievements, whether physical, cognitive, social, or artistic.

Similar findings emerge in minority and low-income societies. Pacific Islands fathers’ attentiveness and help in schoolwork was related to lower child behavioral problems upon school entry, controlling for maternal covariates (Tautolo et al., 2015). A meta-analysis of father involvement in families from diverse ethnic background in the United States showed that both active (e.g., playing, conversation) and passive (e.g., financial support, presence) father involvement linked with lower emotional and behavioral problems in their school-aged children (Harris, 2015).

Finally, fathers play a key role when maternal care is deficient. We followed a birth cohort in which mothers were clinically depressed across the first years of the child’s life. At six years, 60% of the children reared by chronically depressed mothers had a clinical diagnosis, compared to 15% among controls (Apter-Levi et al., 2014, 2016). For these children, sensitive fathering became critically important at 6 and 10 years, reducing the rates of child psychiatric diagnosis by half (Vakrat et al., 2018), and contributing to the development of synchrony. Synchrony, in turn served as a resilience component for these children across the first decade of life, improving mental health, executive functions, and emotion understanding (Priel et al., 2019, 2020). These findings highlight the special role of the father under conditions that involve disruptions to maternal care and demonstrate how in such contexts sensitive fathering may mitigate some of the negative effects.

### Adolescent

The relationship between the adolescent or young adult, particularly male, and his father has been repeatedly depicted in “coming of age” novels and films that describe how a young man leaves the parental home (the village, the small country, the traditional background) to carve a new life elsewhere, and this “story” is, perhaps, one of the great American myths that shaped modern psychology, particularly during the first half of the 20<sup>th</sup> century. A close and positive relationship between father and adolescent or young adult, where the father is sympathetic to the child’s need to leave home and explore, supports the child’s search for identity, tolerates the child’s mistakes, and accepts challenges to the father’s own viewpoints and customs is rarely reflected in the literature and is often hard to find in real life. In contrast, the literature is replete with representations of the adolescent’s struggle for independence, particularly vis-à-vis the father, and several lifetime developmental theories, such as Freud’s or Erickson’s, imply that the struggle

for identity and freedom from the father’s views and demands is a necessary “rite of passage” to maturity.

Whether or not the parent-adolescent struggle is a necessary component in the generation-to-generation transition, where each generation must challenge the attitudes, customs, worldviews, and “ways of doing things” of the previous one to claim its hold on historical time, is not fully clear. It is also unclear whether and how such struggle builds resilience. It is, however, clear that current fathers, who are more attuned to their adolescents’ feelings, more knowledgeable in psychological research, and their parenting assumes a more democratic philosophy that repudiates strict fatherhood, are often more confused in their handling of modern youth, the first technological and social media generation. How can modern fathers build resilience in technologically savvy youth is a topic that requires the attention of both clinicians and developmental scientists.

Still, it is important to remember that the father-adolescent relationship has the potential to promote a host of resilience-building components in the child. In following father-child interactions from infancy to adolescence, we found that father-child reciprocity predicted the adolescent’s relationship with his or her best friend and shaped the child’s ability to dialogue conflict with empathy and respect, suggesting that reciprocal fathering is particularly central to the child’s ability to mobilize assertion and manage moments of conflict or struggle within close relationships (Feldman et al., 2013). These findings show how the father’s support of children’s anger management is utilized in the adolescent’s next attachment with best friend. Similarly, among Chinese adolescents, a secure father-child attachment was associated with greater self-efficacy with peers in adolescence (Pan et al., 2016). Since observational studies of father-adolescent interactions are scarce, it is important to conduct more such studies and pinpoint the behavioral elements in the father’s style that support growth and well-being at this stage.

Adolescence brings with it the expansion of the child’s emotions, interests, and social relationships and the maturation of abstract thought. Abstract cognition enables adolescents to understand, and alongside embrace or reject, the father’s views, ideas, and beliefs but this time not by adopting and sharing, as they did in childhood, but with a fuller grasp that there are two individuals in this relationship who can hold on to multiple perspectives. Such attitude can develop across adolescence and young adulthood when fathering is sensitive, autonomy-granting, and resilience-promoting. Fathers who can assist adolescents to understand that each individual brings to the table a distinct perspective from which he or she views the world, build resilience and enhance cognitive plasticity. Furthermore, such fathers model a sense of humility and show children that they do not consider their own opinions as the ultimate righteous and “must-follow” road. The development of abstract thought allows fathers to share their political and social views, literary tastes, and belief systems with their maturing adolescents in ways that can give explanation, open dialogue, and include a personal narrative. It is also a period when fathers can expand their own personal growth vis-à-vis their developing adolescents’ inquisitive mind and personal search for meaning.

Finally, the adolescent’s growing physical strength and manual dexterity enable father-child joint physical activity that can be more skilled, for instance, organized sports or outdoor activities but also more complex manual skills and fixing techniques in which adolescents increasingly shoulder responsibility for the task. Overall, adolescence is a period when fathers can help their children assume more responsibility, engage in abstract dialogue with



ramifications for society-at-large, and pass on their personal hobbies, tastes, or social engagements. With time, and if fathering was “good enough” and guided by honesty and focus on the child’s well-being, as adolescents become young adults they can begin to see the father as a human being with his strength and weaknesses, forgive moments of failure in the relationship, and build a lifetime father-child adult-adult relationship based on autonomy, respect, mutuality, and sharing. Such father-child bond enables the cross-generational transfer of sociality, culture, and meaning that has been observed throughout human history and across cultural communities and has shaped the collective history of *Homo sapiens*.

### Potential risk factors of fathering to plasticity, sociality, and meaning

Close attachment bonds, particularly the parent-child relationship, run the risk of undermining the child’s resilience and fatherhood carries its own risks. Here, I highlight five potential risks that are typical of fathering, with the awareness that negative parental behaviors and attitudes can come in all forms and many aspects related to intrusion, rigidity, abuse of power, narcissistic parenting, withdrawal, overbearing style, repeated shaming, or inconsistent caregiving undermine the child’s sense of self and impair resilience, whether coming from mother or father. Since not all points are supported by systematic research, these are presented as suggestions.

#### Absence

Among the central problems of fathering, particularly but not exclusively in the United States, is father absence. Millions of children are reared by single mothers, who are often teenagers and live in poverty, without paternal presence altogether or with very sporadic father involvement when fathers are in and out of the child’s life or incarcerated. Divorce marks a second group of children who may not benefit from consistent paternal presence, even under middle-class conditions when distances are long. While there are epidemiological studies indicating that single parenting (father absence) is harmful for children (McLanahan et al., 2013) and adolescents growing up without fathers are more prone to drug abuse, incarceration, underachievement, or school drop-out (Harper & McLanahan, 2004; Nelson & Valliant, 1993; Sigle-Rushton & McLanahan, 2004), the mechanisms that underpin these effects are far from clear. It is still unknown whether the risks posed by the father’s leaving home during childhood or adolescence differ from not having a father at all, at what age father leaving is most harmful and for which outcomes, what are the specific risks (mental health, educational attainment, drug/alcohol abuse, financial stability) found in adults who grew up without a father (teased apart from problems related to SES and poverty), and are there links between father’s leaving at a particular stage and specific negative outcome. It is also critical to assess whether under conditions of father absence, whether involving single-by-choice mothering, absent fathers, or divorce, other caring adults can compensate for the missing father and whether the other caregiving adult must be a male or whether a grandmother, who often plays the primary caregiving role in such contexts, can fulfill the function of the absent father. While humans are not a bi-parental species by nature, fathering confers significant survival and social benefits and not having a father deprives children of substantial survival advantages. Human studies should thus describe the long-term

effects of father absence/inconsistent presence by meticulous research.

#### Abuse

Mother, father, or any adult who has power over a young and helpless child in need of attachment can be abusive and abuse can take many forms. Still, epidemiological data clearly demonstrate that children suffer more physical and sexual abuse from their fathers compared to mothers (Lee et al., 2009; Nobes & Smith, 2000) and proportions of physical and sexual abuse from fathers are higher than any other abuse suffered by non-familial adults (Margolin & Craft, 1989). Several mechanisms may be at work. Infanticide by males (fathers) is not uncommon among primates (Opie et al., 2013) and reasons such as the inherent paternity uncertainty that accompanies internal gestation in mammals have been suggested (Geary, 2000). Fathers are physically stronger than mothers and males are often socialized to display their physical strength and use it to settle disputes and, when combined with a “rough-and-tumble” paternal style, such physicality may get dysregulated, particularly when fathers have low anger management skills and have been abused by their own fathers. Studies have demonstrated the cross-generational transmission of physical abuse and the increased tendency of abused fathers to maintain the cycle of abuse (Conger et al., 2009). Sexual abuse is associated with its own set of risks, including paternal sexual psychopathology, dysregulated sexual behavior, and/or narcissistic, borderline, or psychopathic personality disorder, and may increase in cultures or sub-cultures where women do not have full legal and social rights. Finally, corporal punishment has a long tradition and for long stretches of history it has been believed to be beneficial to children, along the biblical proverb: “spare the rod and spoil the child.” Until recent history, it has been believed that building moral character is the responsibility of the father and that this job can only be achieved through physical punishment. How to differentiate “educational” hitting from physical abuse, where do such practices still abound, and what are the best ways to eliminate capital punishment while maintaining respect to the cultural heritage is a matter that requires much empirical research and clinical wisdom.

#### Rigidity

Because fathers are still more distant from the day-by-day activities of family life, even in modern households, and have traditionally been responsible for instilling moral character in children and for the transfer of cultural and/or religious practices, fathering runs the risk of being rigid. Rigidity can come in multiple ways; inability to allow the child to express weakness, anger or dissatisfaction with milder or more major failures, expectations that the child “grows up” faster, and difficulty to see the child’s developmental stage, personality traits, or personal preferences. Rigidity is a style that places rules, costumes, external success, or outside appearances before the emotional needs of the child and puts more emphasis on the father’s beliefs, needs, or social standing than on the child’s inclinations, talents, or limitations. The aforementioned components of the father’s unique style that serve as building blocks of resilience – challenging children to reach their potential, focusing on the outside environment, promoting the adherence to rules, instilling moral obligations, and regulating the child’s anger and conflict – run the risk of being too tightly imposed, particularly when not combined with flexibility, moment-by-moment attention to the child’s inner world, and positive affect and warmth. Overall, rigidity is an antidote to the development of authenticity in

children and severely undermines the flexibility component of resilience.

### Expectations

Alongside the risk of rigidity, fathers are at risk of expecting too much from their children, driving children to excel, or pushing children to choose a career path that is not authentic to their needs, internal wishes, and talents. Over-ambitious parenting that expects too much of the child, places shame on minor failures, accepts only excellence, and is underpinned by the parent's need to "show off" the child's success, is a risk inherent in both mothering and fathering, but the father's unique position in the family and authoritative style may give his expectations a special place in the child's developing sense of self and professional choices. There is a very thin balance between expecting children to succeed, which children need in order to internalize a belief in their own abilities, and imposing parental ambitions that are unrealistic, stem from the parent's narcissistic needs, and are disconnected from the child's abilities and desires. Balancing this thin line is perhaps one of the most difficult tasks of parenting in general and fathering in particular.

### Gender typing

Studies on parental gender typing and the "permission" boys and girls have to engage in play activities that are typical for the other gender – boys' playing with dolls and girls engaging in rough sports – have shown that fathers tend to have stricter gender typing attitudes and that their gender typing expresses more strongly when their son wishes to engage in "girlish" activities than when their daughter shows tomboyish tendencies (Farr et al., 2018; Turner & Gervai, 1995). How can fathers open their children, across ages, to experience the full range of activities and express the full range of their talents and inclinations is a topic that requires more research, parental education, and societal changes. This question bears important implications on broader societal issues related to how young men and women in our society can flexibly develop their individual abilities with curiosity, authenticity, and support from both their own fathers and the "paternal figures" of society-at-large.

### Summary

Fathering – a biological phenomenon that expresses in a wide variety of formats which are responsive to time, place, context, and caregiving – has been undergoing rapid changes over the last decades with fathers' growing involvement in childcare and increased focus on their parental role. This change impacts children's resilience in multiple ways that differ according to the child's age and developmental stage. Guided by our model on resilience, we suggest that fathers impact the three tenets of resilience – plasticity, sociality, and meaning – in unique ways that carry biological, cognitive, social, and cultural implications and have so far received little empirical attention. While fatherhood is perhaps the most rapidly changing role in the history of the human family, much further developmental research, theory-building, and father- and family-specific interventions should follow the social change in order to help fathers foster children's resilience in ways that are flexible, sociality-focused, and are sensitive to the father's cultural heritage, personal beliefs, familial history, and ethical values.

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