

Emotional development

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Key points

- During adolescence, biological and environmental factors independently and jointly lead to changes in the variance, valence, and intensity of emotional experiences.
- Emotional development during adolescence creates unique opportunities for learning and growth that shape developmental trajectories and influence adulthood outcomes.
- Researchers are calling for a more nuanced understanding of the macro-level contexts, including culture, digital media use, and shared historical events, that individually and together exert favorable and unfavorable impacts on adolescent emotional health.

Glossary

Emotional competence Being aware of one's own emotion state and the emotional state of others, using appropriate emotion vocabulary, having sensitivity to others' experiences, and being aware of the role of emotions and their expression in relationships.

Emotional expression A behavior that communicates an emotional state or attitude.

Emotional reactivity The way an individual responds to an emotional event that differs in intensity and duration between individuals.

Emotion regulation The ability to modulate one's emotional arousal such that an optimal level of engagement with the environment is fostered.

Emotion socialization The dynamic process through which an individual learns to recognize, label, and manage their emotional displays in social contexts.

Heritability A statistical estimate of the contribution heredity makes to a particular trait or ability.

Neo-ecological model An adaptation of Urie Bronfenbrenner's bioecological theory that delineates the existence of two forms of microsystems—physical and virtual—and emphasizes the role of the macrosystem (i.e., the influences of culture and within-society subcultural variation) in understanding development.

Nonshared environment A set of conditions or activities that lead to differences between one child in a family and another child in the same family.

Shared environment A set of conditions or experiences that lead to similarity between children being raised in the same family.

Abstract

Emotions and their development play a crucial role in the daily lives and experiences of adolescents. Emotion is commonly defined as a psychological state of specific duration that involves behavior expression, conscious experience, and physiological arousal. During adolescence, emotional development is influenced by biological and environmental factors including changes in brain structure, function and connectivity; distinct hormonal and physiological developments linked to puberty; and dynamic shifts within and between the nested social/cultural contexts surrounding youth. The independent and joint impacts of these influences lead to changes in the variance, valence, and intensity of adolescent emotional experiences. Research indicates this developmental period presents a crucially important window for learning and growth that shape developmental trajectories and influence adulthood outcomes—healthy emotional development is strongly tied to adolescents' well-being, interpersonal skills, relationship quality, educational attainment, and later employment, as well as to their risk for developing behavioral and emotional disorders such as conduct disorder or depression.

Introduction

Emotions and their development play a crucial role in the daily lives and experiences of adolescents. Emotion is commonly defined as a psychological state of specific duration that involves behavior expression, conscious experience, and physiological arousal (Scherer, 2005). Emotions arise from a process of appraisal of situations which in turn influence motivation and behavior (Ellsworth and Scherer, 2003). During adolescence, emotional development is influenced by biological and environmental factors including changes in brain structure, function and connectivity; distinct hormonal and physiological developments linked to puberty; and dynamic shifts within and between the nested social/cultural contexts surrounding youth. The independent and joint impacts of these influences lead to changes in the variance, valence, and intensity of adolescent emotional experiences. Behaviorally, adolescents show high levels of emotionality (adolescents experience more extreme, intense, and fleeting emotions) compared to adults, and experience emotions in ways that differ from emotionality in early childhood (Bailen et al., 2019; Guyer et al., 2016).

Similar to previous research focusing on early sensory, motor, and language development, recent studies indicate that adolescence presents a second, crucially important window of opportunity to influence brain development (Andersen, 2003). Adolescents' heightened neuro-sensitivity, as well as normative changes in neural and hormonal development, intersect with key contextual changes across social/cultural environments. The nature of these changes creates unique opportunities for learning and growth that shape developmental trajectories and influence adulthood outcomes (Andersen, 2003). Healthy emotional development is strongly tied to adolescents' well-being, interpersonal skills, relationship quality, educational attainment, and later employment, as well as to their risk for developing behavioral and emotional disorders such as conduct disorder or depression (Guyer et al., 2016).

Definition of emotions

William James (1884) began the exploration of emotions in human development and experience by asking "What is an emotion?" Today, this question still captures our interest, and research is forever attempting to better answer this question. The development and use of emotions plays a particularly important role in adolescence as youth use emotion and emotion regulation to navigate their constantly broadening experiences of the world. Emotion is commonly defined as a psychological state of specific duration that involves behavior expression, conscious experience, and physiological arousal (Scherer, 2005). Frequently, emotions occur when an individual is in an interaction that is important to him or her, particularly to his or her well-being.

The expression of one's own emotions and the understanding of emotions in others are essential in several key areas, such as gaining emotional competence skills, building friendships and social skills, and developing appropriate emotions as one matures. *Emotional expression* can vary based on family values, cultural backgrounds, or social norms. For example, emotion displays and display rules are rooted in cultural differences that govern both non-verbal and verbally expressive behaviors across different social contexts, specifying who can show emotion to whom and when (Denham, 2009).

Some of the important mechanisms of emotion expression and understanding include emotional competence, emotion regulation, and emotion reactivity. *Emotional competence* involves being aware of one's own emotion state and the emotional state of others, using appropriate emotion vocabulary, having sensitivity to others' experiences, and being aware of the role of emotions and their expression in relationships (Lau and Wu, 2012). *Emotion regulation* consists of effectively managing emotions and arousal to adapt, cope, and reach goals (Zimmermann and Iwanski, 2018). Sex differences have been observed in emotion regulation strategies with adolescent girls reporting more social support seeking and dysfunctional rumination and boys reporting more passivity, avoidance, and suppression (Cracco et al., 2017). Girls show higher empathy, more prosocial behaviors, and more effective regulation of negative affect than do boys (Van der Graaff et al., 2014; Zimmermann and Iwanski, 2014). Although relatively few researchers have examined the role of sex in relation to the linkages between emotion regulation and adolescents' social and behavioral adjustment, available findings imply that emotion regulation may interact with sex when predicting adjustment outcomes. Boys are more likely to develop behavioral problems, such as acting-out or drug and alcohol abuse, whereas girls are more likely to develop emotional problems such as moodiness, anxiety, depression and suicidal ideation (Krause et al., 2018; Garnefski et al.,

2005). Finally, *emotional reactivity* is the way an individual responds to an emotional event, including facial expressions and physiological reactions, such as increased heart rate when excited, or flushed cheeks when embarrassed (Carlo et al., 2012).

Nominal categories and structures of emotions

Emotions have typically been categorized as either primary or secondary. Primary emotions involve both positive and negative emotions which are for the most part innate, including smiling, laughter, anger, sadness, and fear (Damasio, 1994). Secondary emotions involve a higher-order set of feelings and are typically referred to as self-conscious emotions such as embarrassment, pride, guilt, and shame (Damasio, 1994).

Primary emotions are the more basic human emotions, are universal across all human cultures, and are seen very early in a child's development. Basic emotions promote survival and aid in communication and social interaction. The primary emotions are broadly divided into positive and negative emotions (Damasio, 1994). Positive emotions include enthusiasm, joy, and happiness. These emotions involve expressions such as smiling or laughter. These positive emotions promote healthy social interactions and the overall survival of a child. Negative emotions include anger, disgust, fear, and sadness. Anger and sadness are present very early in childhood and help express needs to caregivers through nonverbal cues (Sauter et al., 2010). Both positive and negative emotions involve social referencing or reading the emotional cues of others early on and continue to be highly influenced by relationships throughout development (Bailen et al., 2019).

The frequency with which specific emotions are experienced seems to change in childhood and adolescence. There is some evidence that compared to younger adolescents, older adolescents experience fewer positive and high-intensity positive emotions, as well as more frequent negative and high-intensity negative emotions (Frost et al., 2015; Larson and Lampman-Petratis, 1989). Sex differences have also been found; girls report more frequent low-intensity positive and low-intensity negative emotional experiences compared to younger girls (Larson and Lampman-Petratis, 1989). Similarly, older boys report more frequent low-intensity negative emotional experiences compared to younger boys (Larson and Lampman-Petratis, 1989).

Cross-cultural similarities and differences in emotional experiences have also been found. Veljko Jovanovic and colleagues (2022) examined positive and negative emotions in adolescence across three countries: Poland (high on individualism), Serbia (high on collectivism), and India (elements of both individualistic and collectivistic societies). Findings indicated Polish adolescents demonstrated the lowest levels of affective well-being (i.e., the highest levels of negative emotional experiences and the lowest levels of positive emotional experiences) compared to Indian and Serbian adolescent samples. Both Indian and Serbian adolescents showed no substantial differences in their levels of positive and negative emotions. Although the three selected countries were shown to differ along cultural dimensions such as individualism and collectivism, the extent to which the individual participants ascribed to these values was unknown. According to Taras and colleagues (2016), this is a common but significant limitation in cross-cultural studies as roughly 80% of cultural variation may occur *within* countries, not between. Thus, future studies may benefit from considering within-country differences in cultural values in addition to cross-national groupings in order to evaluate cross-cultural invariance in emotional experiences and understand how socio-cultural environments influence adolescents' emotional functioning.

Secondary emotions, or self-conscious emotions, include emotions that involve injury to or enhancement of the way we view ourselves, known as our sense of self. These higher-order emotions include guilt, shame, pride, embarrassment, and envy. Self-conscious emotions can involve having a negative view of oneself and one's behavior as in the case of shame or embarrassment. However, self-conscious emotions may also involve an individual feeling happiness in reference to themselves and their personal achievements, as is the case with pride (Damasio, 1994).

Secondary emotions are more complex and require the ability to differentiate and integrate several aspects and roles of a situation, particularly the role of personal responsibility. These emotions generally tend to emerge in early childhood and become more developed throughout childhood and adolescence, including a shift in focus from externalizing behaviors to internal thoughts and intentions (Muris and Meesters, 2014). For example, Gavazzi and colleagues (2011) used narrative analysis to examine how children and adolescents (9–16 years) conceptualized guilt. They found while children primarily associated guilt with actions causing damage or violating rules, adolescents described guilt more frequently to the consequences of their interactions with others (e.g., treating someone poorly, betrayal, etc.). Though secondary emotions relate to how individuals view themselves, they are still frequently influenced by how others view the individual and by social interactions (Johnson-Laird and Oatley, 2000).

Biological and environmental influences on emotion development

Adolescent emotional development includes biologically determined and experience-dependent influences. Differences in heritability, pubertal surges in hormones, and changes in functional brain networks interact with external factors in the environment during adolescence to amplify or attenuate risk for psychopathology (Bailen et al., 2019; Guyer et al., 2016). Second only to infancy, the period of adolescence offers an important window of opportunity to alter developmental trajectories away from or toward problematic outcomes across the life course (Andersen, 2003).

Genetic contributions

Researchers often study family members whose degrees of biological relatedness are known to investigate the contributions of heredity and environment to individual differences (Ehringer et al., 2006). Heritability, by definition, is a statistical estimate of the contribution heredity makes to a particular trait or ability (Ehringer et al., 2006). Shared environment refers to a set of conditions or activities that lead to similarities between one child in a family and another child in the same family (Ehringer et al., 2006). In contrast, nonshared environment refers to a set of conditions or experiences that lead to dissimilarities between children raised in the same family (Ehringer et al., 2006). Behavioral genetic research has moved beyond simple estimates of heritable and nonheritable influences to studies exploring the intricate ways that genes and environments work in concert to shape adolescent social, emotional and behavioral problems. This includes exploring to what extent an individual's genetic predispositions result in him or her selecting (or being selected into) a particular environment, a phenomenon known as *gene-environment correlation* (Plomin et al., 1977). While passive gene-environment correlations occur when children's genes and their environment come from the same source (i.e., their parents/caretakers), adolescence marks the starting point of emerging, individual-specific environmental opportunities. As such, gene-environment correlations are considered "active" as the individuals select environments or niches that are compatible with their personalities, attitudes, and behaviors based on genetically influenced traits (Plomin et al., 1977; Schwartz et al., 2019). For example, an aggressive adolescent may choose to affiliate with ("select into") an antisocial or deviant peer group, increasing risk for delinquency or substance abuse (Chen et al., 2015).

Studies have consistently shown genetic predispositions play an important role in the development of two broad categories of psychopathology symptoms characterized by emotion dysregulation during adolescence—*internalizing* and *externalizing* behaviors (Achenbach, 1966). Internalizing behaviors are characterized by internal expression of distress (e.g., social isolation, withdrawal, anxiety, depression, somatization). Externalizing behaviors, on the other hand, are directed outwardly (e.g., aggression, impulsivity, deviance, hyperactivity, substance use disorders; Achenbach, 1966). Genetic studies consistently find evidence for a moderate to substantially high genetic contribution to internalizing symptoms in adolescence, including persistent feelings of sadness, despair, loneliness, and hopelessness as well as fearfulness and anxiety (Patterson et al., 2018). Longitudinal research examining developmental changes in genetic and environmental influences indicates that genetic variance in internalizing problems is relatively stable during adolescence, with environmental influences more varied across development (Patterson et al., 2018). Additionally, differences in environmental influences on internalizing have been associated largely with age rather than puberty (Patterson et al., 2018).

With respect to negative, externalizing emotions such as anger and aggression, researchers have found moderate to substantial genetic and nonshared environmental variance (Tarantino et al., 2014). The candidates for nonshared environment processes include harsh reactive parenting, peer rejection, and delinquent peer affiliation (Burt et al., 2009). Longitudinal studies have shown that the development of externalizing symptomatology is linked to problems in parent-child interaction, particularly, the presence of harsh and coercive parenting (Pinquart, 2017). For example, research indicates strong phenotypic associations between children's aggressive behaviors and their parenting environments (Deater-Deckard and Wang, 2012). However, much remains to be learned about whether such nonshared environmental processes can be identified and replicated across studies.

Pubertal maturation and neurodevelopmental processes

Puberty and adolescence are often used interchangeably; however, they refer to distinct developmental processes. Puberty describes reproductive maturation driven by hormonal changes, while adolescence not only includes the physical changes associated with puberty, but the broader transitional phase of development between childhood and adulthood in which individuals also experience rapid cognitive, emotional, and social growth (Blakemore et al., 2010). Structural and functional neuroimaging studies suggest pubertal hormones influence the structure and function of the adolescent developing brain and contribute to the increased reactivity in brain regions involving emotional and reward processing (Juraska and Willing, 2017). Additionally, researchers suggest the effect of early exposure to pubertal hormones on developmentally immature brain systems may partly explain the pathophysiology of internalizing disorders (Ladouceur, 2012). The reshaping and reorganizing of neural connections in the brain, often referred to as neuroplasticity, occurs through the dual processes of synaptic pruning and myelination. Similar to the notion of "use it or lose it," unused neural connections are removed (synaptic pruning) and utilized connections are strengthened (myelination; Dow-Edwards et al., 2019). Magnetic resonance imaging (MRI) studies have revealed that compared to the rapid maturation of limbic brain regions (leading to intensification of emotions), the regions of the prefrontal cortex (associated with emotional and behavioral regulation) mature more slowly (Ladouceur, 2012). Researchers have suggested the mismatch in the developmental trajectories of these two brain regions may explain why when adolescents encounter emotionally salient situations, the more mature limbic system will likely "win over" the prefrontal control system (i.e., the salience of the emotional context biases their responses; Ladouceur, 2012).

To summarize, the streamlining of neural circuits occurs in response to physiological changes (e.g., hormonal shifts), environmental demands (e.g., school transitions), and experiences (e.g., peer acceptance or exclusion) and consequently can exacerbate the risk of psychopathology or strengthen pathways to adult well-being and positive mental health (Guyer et al., 2016; Powers and Casey, 2015).

Environmental influences

Urie Bronfenbrenner's (1994) ecological model provides a comprehensive framework to understand how various environmental factors influence emotional development during adolescence, across different levels and over time. More specifically, emotion development and emotion regulation are largely social processes that occur within a series of interconnected microlevel contexts (e.g., family environment, peer relations) and macrosocial determinants (e.g., social/cultural norms, digital communication, social media engagement, shared historical events). Through emotion socialization, adolescents learn to recognize, label, and manage their emotional displays, as well as social norms for expressivity and regulation (Klimes-Dougan et al., 2014). As adolescents encounter new social and emotional challenges, they continuously learn from others in their environment regarding how to use emotional skills in a flexible and differentiated manner (e.g., expressing anger more discreetly in a public setting than in the privacy of their own home; Hale et al., 2023). Beyond descriptions of different levels of influence, the ecological model also emphasizes the dynamic interplay between levels. For example, a supportive family environment (microsystem) might buffer the effects of stress experienced due to an underfunded school system (exosystem), leading to better emotional regulation. Conversely, a challenging family environment (microsystem) combined with societal discrimination (macrosystem) can lead to increased anxiety or exacerbate emotional difficulties in adolescents.

Influences of parenting behaviors and family environments

Family influences on the development of emotion can be seen in parenting practices, emotional family climate, and different emotional learning experiences. In particular, supportive parenting and parental involvement play an important role in the development of emotional competence in adolescents. For example, parents' warmth and positive expressivity are related to adolescents' effortful control—a temperamental characteristic contributing to emotion regulation—which in turn predicts low levels of aggression and delinquency (Eisenberg et al., 2005). On the other hand, across multiple cultures, harsh parenting and lack of parent involvement are associated with impulsivity, aggression, noncompliance, moodiness, and low self-esteem among adolescents (Di Giunta et al., 2020). In addition, attachment seems to be specifically influential for the effectiveness of emotion regulation because attachment patterns established in early life represent specific ways of interactive regulation behavior with the caregiver. Broadly speaking, individuals with *secure attachment* are better able to acknowledge and cope effectively with negative emotions, individuals with *avoidant attachment* tend not to acknowledge negative emotions and consequently may act emotionally without full knowledge of the reasons, and individuals with *anxious attachment* are often highly emotionally expressive but unable to regulate their emotions with personal interests or social norms (Cooper et al., 1998). Therefore, children with primary caregivers who are sensitive and respond appropriately to their needs (i.e., secure attachment) are more likely to establish effective emotional and interpersonal skills that ultimately facilitate a healthy transition to adolescence (O'Connor et al., 2019). In adolescence, secure attachment, reflected by characteristic strategies for processing affect and memories surrounding attachment experiences with caregivers, is positively linked to higher self-esteem and competence with peers, as well inversely related to lower levels of internalizing behaviors and lower levels of deviant behavior (Allen et al., 1998; Kobak et al., 1991).

In contrast, studies of maltreating families reveal that child maltreatment presents a significant threat to the optimal development of emotional understanding and regulation, partly due to the absence of sensitive interactions between the caregiver(s) and the child (Mills et al., 2013). Maltreated children and adolescents tend to be angrier and more frustrated, reactive, and irritable than their nonmaltreated peers. In particular, physically abused children and adolescents may experience overwhelming emotional arousal that leads to difficulties managing and processing negative emotionality (Kim and Cicchetti, 2010). Indeed, existing literature indicates that maltreated children and adolescents experience numerous deficits in the recognition, expression, and understanding of emotions (Shackman and Pollak, 2014).

Research has demonstrated that high levels of parental conflict can have deleterious effects on adolescents. Given adolescence is a time of sensitivity to psychosocial stressors, consistent research has linked frequent, intense, and unresolved conflicts between parents to increased adolescent susceptibility to internalizing problems, such as depression (Barton et al., 2015) and anxiety (Suh et al., 2016), as well as externalizing problems such as aggression (Cummings et al., 2003). Adolescents may be affected directly by marital conflict by witnessing fights and arguments between parents. In particular, the history of parental conflict influences adolescents' emotional security, as evidenced by higher levels of emotional reactivity (Buehler et al., 2007). Adolescents are also likely to experience the indirect effects of marital conflict due to its impact on parenting behaviors—the effects "spilling over" (i.e., influencing or transferring) from the interparental to the parent-child relationship (Hosokawa and Katsura, 2019). Parents engaged in marital conflict often lack emotional availability, are less responsive to their adolescents' needs and are less able to provide authoritative parenting, all of which has been subsequently linked with emotional health among adolescents (Doyle and Markiewicz, 2005; Sturge-Apple et al., 2006).

Interestingly, studies have revealed the effects of marital conflict on children are likely to vary by gender, with findings suggesting boys are more susceptible to the negative effects compared to girls (Hosokawa and Katsura, 2019). Boys tend to respond to adult anger with their own anger and aggression, often leading to externalizing problems, whereas girls are more likely to respond with fear or to exhibit distress leading to self-blaming behavior and other processes associated with internalizing problems (Cummings et al., 1989; Hosokawa and Katsura, 2019).

Finally, family economic environments seem to influence family processes, which in turn, are related to adolescent emotional development. Prior studies have demonstrated the negative impact of persistent poverty on adolescent emotional adjustment. For

example, researchers have established links between financial stress (including both objective measures like per capita income and subjective measures like financial satisfaction) and lower levels of emotional, cognitive and behavioral self-regulation (i.e., inhibiting or changing initial and dominant thoughts, feelings, or behaviors in order to maximize one's own long-term rewards; Farley and Kim-Spoon, 2017). Household chaos, reflected in crowding, increased noise, poorer quality housing, as well as less structure, routine, and predictability, has also been found to compromise healthy regulatory abilities in parents by disrupting the socialization process of adaptive emotion regulation in their adolescents (Deater-Deckard, 2014).

Economic hardship has both direct and indirect links to adolescents' emotional well-being. According to the family stress model posited by Conger and colleagues, economic difficulties lead to parents' feelings of economic pressure, and this pressure, in turn, influences parents' emotional distress (e.g., depression). Greater emotional distress then affects parenting practices, and these disrupted parenting practices ultimately impact child and adolescent developmental outcomes (Conger and Donnellan, 2007; Conger et al., 1994). While the family stress model shows how economic pressure operates indirectly through its effects on parents, Chase-Lansdale and colleagues (2011) also found evidence that economic problems in the family increasingly capture adolescents' awareness and concern, which in turn, makes hostility and externalizing problems more likely (Chase-Lansdale et al., 2011; Taylor et al., 2004, 2014).

Importantly, the family stress model was developed in the context of poor, rural, White families (Conger and Donnellan, 2007). Examinations of the applicability of the model across different racial and ethnic groups has yielded mixed results. While studies with samples from Finland and China have demonstrated the model's international applicability (Solantaus et al., 2004; Sun et al., 2015), other studies have indicated a lack of support for the model with English-speaking Hispanics and Asian American families (Iruka et al., 2012). Given family processes are culturally defined and cultural groups differ in how they interpret, experience, and cope with distress (e.g., marital conflict, financial hardship), further investigation is needed to understand the generalizability of the family stress model when examining the links between family functioning and adolescent social and emotional outcomes (Iruka et al., 2012).

Influences of peer relations

Emotion development and emotion regulation are largely social processes that occur within the context of social interactions. During adolescence, peer networks, often defined broadly to include close friends, classmates, schoolmates, and those of similar ages, become increasingly important socializing agents and are a major determinant of emotional well-being and mental health (Ryan, 2001). Peers act as socializers of emotion by reacting to the emotions of one another, expressing emotions to one another, and discussing emotions (Klimes-Dougan et al., 2014). It is within peer relationships that adolescents develop important interpersonal skills distinct from those developed in the family, as peer relationships are voluntary and more egalitarian (Schulz et al., 2023).

Positive peer experiences (i.e., being liked and accepted by the peer group) are linked to higher self-esteem, greater positive affect, and fewer internalizing problems (Moses and Villodas, 2017; Oberle et al., 2009). Conversely, negative peer experiences, such as rejection or victimization, have been associated with higher levels of internalizing and externalizing problems, and increased likelihood of excessive risk-taking and substance use (Herd and Kim-Spoon, 2021; Platt et al., 2013; Rubin et al., 2008).

As adolescents become more reliant on peers for companionship and as a primary source of social support, friendship interactions become more sophisticated involving greater disclosure and higher emotional intimacy (Vijayakumar and Pfeifer, 2020). Whereas peer relationships are often based around shared activities during childhood, adolescence is characterized by greater time spent in conversation with peers (Vijayakumar and Pfeifer, 2020). When adolescents share personal information and the feedback they receive from others helps to validate the appropriateness of their feelings, key developmental goals are attained. Studies show self-disclosure behaviors play an important role in strengthening relationships, shaping identity and promoting self-worth and psychological well-being (Davis, 2012). Moreover, emotional supportive friendships, characterized by warmth and intimate exchange, can mitigate the link between peer victimization and internalizing symptoms by providing a context to share and problem-solve (Holt and Espelage, 2007).

With the rise in frequency and intensity of peer interactions, adolescents also show heightened attunement to, concern over, and reaction to perceived instances of peer evaluation (Somerville et al., 2013). The peer group becomes a key context within which adolescents seek acceptance and belonging. Structural and functional imaging studies have revealed neural development contributes to adolescents' susceptibility to peer influence and heightened social sensitivity (i.e., higher emotionally reactivity to explicit cues indicative of social inclusion or exclusion). More specifically, brain regions involved in emotion generation and regulation undergo protracted structural and functional development. For example, Sebastian and colleagues (2011) have shown how compared to adults, prefrontal brain regions regulate affective states less effectively during adolescence resulting in a more acute subjective experience of social rejection.

Emotional reactivity is not limited to instances of peer rejection. Guyer and colleagues (2012) showed increased activation of the ventral striatum (brain region playing a prominent role in reward processing) and reported a boost in positive affect in adolescent participants when they experienced social acceptance from a desirable peer (i.e., a peer that labeled them as "high-interest" to chat with).

Importantly, adolescents' emotional regulatory abilities and social adjustment influence one other in a reciprocal fashion: while healthy peer relationships offer a supportive environment for gaining experience in emotion regulatory skills (Wang and Hawk, 2020), adolescents who are better able to regulate overt emotional behavior are more likely to have successful peer interactions

(Perry-Parrish et al., 2017). Adolescents must regulate their own emotions correctly in order to accurately interpret social and emotional cues in the environment. Adolescents who exhibit good emotion regulation and emotional competence are likely to have strong social skills and show socially appropriate behavior (Booker and Dunsmore, 2017; Sahi et al., 2023). In contrast, adolescents high in negative emotions or lacking emotion regulation are at a greater risk of not only behavior problems but also of poorer social skills, which can in turn lead to poor social relationships (Sahi et al., 2023). In such cases, interpersonal adversity has been found to have detrimental effects on adolescent emotional and behavioral health. Not only does peer rejection create an absence of positive peer socialization functions including social support and modeling of effective emotion regulation, the effects of the interpersonal stress created by rejection or exclusion often lead to high levels of negative emotions (Southam-Gerow and Kendall, 2002).

Similarly, peer victimization has harmful consequences for adolescents' emotional development. Peer victimization occurs when an adolescent is bullied by other peers—including physical victimization as well as relational victimization (in which peers try to damage or control their relationships with others; Prinstein et al., 2005; Sullivan et al., 2006). Victimized adolescents are more likely to be anxious, depressed, and lonely and tend to have more negative perceptions of their competence (Stapinski et al., 2015). Further, individuals who are bullied not only experience internalizing distress, but may also be targeted as a result of how they manage these symptoms (Hunt, 2015).

Influence of cultural beliefs and norms

Cultural beliefs and norms play an important role in shaping how emotion is defined, experienced, and acted on. Emotion is both universal and culture-specific with biological and cultural determinants (Matsumoto and Hwang, 2012). Cross-cultural studies of emotional response typically focus on three components: physiological changes (e.g., heart rate), subjective feelings (e.g., happiness or sadness), and facial expressions (e.g., smiles or frowns). While physiological responses are often similar across cultures, facial expressions can vary significantly. For instance, Tsai and colleagues (2002) found that European Americans smiled more than Hmong Americans when reliving happy events, even though both groups reported feeling equally happy.

One major dimension of cultural variation is the concept of individualism/collectivism-individualistic cultures are found typically in Western regions such as North America and most of Northern and Western Europe, while collectivistic cultures are typically found in Eastern regions such as Asia (Triandis et al., 1988). Soto and colleagues (2011) found that the relationship between suppressing emotional facial and vocal displays and psychological well-being varies by culture. In individualistic societies, where open expression is encouraged and considered an important aspect of positive interactions, emotional suppression is associated with higher levels of depression and lower levels of life satisfaction (Soto et al., 2011). On the other hand, in collectivistic cultures, where suppressing emotions is needed to appropriately interact with others within interdependent communities where group harmony and social interdependence is prioritized, emotional display is carefully controlled to avoid disrupting social equilibrium, and emotional suppression is not associated with depression or life satisfaction (Soto et al., 2011). For instance, in a study by Wan and Savina (2016), European American and Hong Kong Chinese adolescents were asked to rate the effectiveness of different strategies for regulating sadness, anger, and fear. Both European American and Chinese adolescents considered situation avoidance to be most effective for dealing with anger. Compared to Chinese adolescents, European American adolescents rated talking to someone and positive thinking as more effective with all emotions (Wan and Savina, 2016).

Even within seemingly homogeneous collectivistic societies, adolescents show differences in emotion regulation. Morelen et al. (2012) compared how adolescents in Ghana, Kenya, and the United States manage anger and sadness. Notable differences were found between the three groups: Ghanaian adolescents reported higher levels of overt anger expression and less inhibition compared to their Kenyan counterparts, while US youth exhibited the lowest levels of outward anger expression and greater constraint. Importantly, research on cultural differences in emotional experience and expression in adolescence has primarily focused on westernized, affluent, and culturally homogeneous populations, largely emphasized Eastern-Western comparisons, and relied on measurements developed in Western cultures. These limitations make it difficult to interpret the cultural differences or the lack of cultural differences. There has been an increasing call for the use of multiple methods and direct measurements, including observation and ethnographic approaches to better understand cultural similarities and differences in emotion development among diverse adolescents.

Impact of digital technology

The rapid advent and adoption of digital technologies has necessitated a reframing of Bronfenbrenner's ecological model to include both physical microsystems experienced by a developing person in face-to-face settings and virtual microsystems experienced by the developing person on a given digital platform. This neo-ecological model allows for an individual to participate in interactions within two microsystems simultaneously—for example, an adolescent might participate in remote learning in their home (first microsystem) while simultaneously engaging with classmates via an online platform (second microsystem; Navarro and Tudge, 2023).

According to Nesi and colleagues (2018) transformation framework, there are six notable ways in which the digital context is fundamentally different from traditional, in-person contexts; 1) *asynchronicity of communication* (i.e., time lapse within conversations creating delays in interpersonal feedback, providing more time to construct responses, and allowing participation in multiple conversations simultaneously); 2) the relative absence of interpersonal cues (e.g., tone of voice, facial expressions, gestures);

3) *availability* (i.e., ease with which content can be accessed and shared, as well as removal of barriers, geographic or otherwise, for peer connection and communication); 4) *publicness of interactions* (i.e., potential for audiences that are larger or invisible); 5) *permanence of shared information* (i.e., extent to which content or messages remain accessible following an original interaction or post), and 6) *quantifiability of interactions* in the form of likes, views, and comments (i.e., extent to which social media allows for numerical social metrics).

Each of these features in the digital media context has the potential to transform the nature of adolescent peer relationships and the social and emotional processes that shape them. For instance, asynchronous communication may contribute to more productive conversations when there is high emotional involvement in problem-solving. In a study examining simulated negotiation processes, participants in asynchronous settings had more time to reflect, cool down and regulate their emotions while those communicating synchronously engaged in more emotionally-charged and competitive “hot” debates (Pesendorfer and Koeszegi, 2006).

Conversely, the absence of cues, particularly during adolescence, may undermine online conversations involving problem-solving and negotiation as the ambiguity leads to greater levels of interpretation bias, or the tendency to ascribe threatening interpretations to ambiguous social situations (Nesi et al., 2018). In qualitative work, adolescents reported the inability to share facial expressions, body language, or tone of voice on some platforms resulted in misinterpretations and misunderstanding within conversations (Madell and Muncer, 2007). Yet there is still evidence to suggest the lack of cues of the online environment may actually contribute to a sense of comfort that increases self-disclosure with existing friends online and strengthens relational closeness (Valkenburg and Peter, 2009).

The availability of the online environment, including the ease with which contact can be initiated and networks joined (e.g., sending a text vs. driving to a friend’s house) is especially appealing during adolescence when peer interactions become increasingly desired, frequent and central to social and emotional well-being. The availability of the online environment provides a unique opportunity of having a friend with whom an individual has not met in person. Although research suggests online exclusive friendships may be of lower quality than offline friendships (Antheunis et al., 2012), for adolescents who are lonely or socially isolated, such friendships may provide companionship and offer ways to receive emotional support. For example, Hwang and colleagues make the case that for adolescents with depressive symptoms, making friends online and expressing thoughts or feelings that they are unable to express otherwise may reduce loneliness and compensate for peer difficulties offline (Hwang et al., 2009).

As digital media has become salient developmental context and central feature in the lives of adolescents, considerable debate and disagreement exist regarding its potential beneficial or harmful impact on psychosocial functioning. In general studies examining links between digital technology use and emotional well-being have yielded a wide range of results including: significant but minimal negative associations (particularly when compared to smoking marijuana or bullying both of which have much larger negative associations; Orben and Przybylski, 2019); positive effects on adolescent social emotional development, highlighting the potential benefits of social media platforms such as increases in socialization, social support, social connection, and enhancements to autonomy, communication skills, and well-being (Haddock et al., 2022); and reports of no association and little support for the narrative that adolescents’ digital technology usage is associated with elevated mental-health symptoms. (Jensen et al., 2019). There is growing consensus the impact of technology on adolescent emotional development appears to vary by individual differences and the quantity and quality of digital media use. For instance, although time spent online appears to displace in-person interactions, adolescents primarily use mobile technologies to communicate and stay connected to existing friends which, in turn, may be strengthening the quality of existing relationships (Davis, 2012). This is particularly true when considering the evidence that suggests online communication between friends promotes self-disclosure and feelings of belonging (Davis, 2012).

On the other hand, several mechanisms have been proposed to explain the increased risk brought on by social media for internalizing problems. The publicness and quantifiability of interactions highlighted in the aforementioned transformation framework may facilitate maladaptive interpersonal behaviors and coping strategies among adolescents (e.g., intensified identity and peer acceptance concerns contribute to negative self-evaluations, worsening negative mood, excessive interpersonal feedback seeking, upward social comparisons, rumination, and co-rumination; Nesi and Prinstein, 2015). Similarly, the hyperpersonal model of online communication purports that digital media offers a context of public social commentary and a space to reveal selective self-presentations of idealized selves, both of which lead to rapid shifts in self-evaluations based on frequent feedback that exacerbate adolescents’ self-focus and concerns with identity formation and peer acceptance (Shapiro and Margolin, 2014). As adolescent environments become increasingly saturated with digital technology (varying across multiple demographic variables– gender, race/ethnicity, and household income), there have been increasing calls to move beyond a focus on adolescents’ quantity or frequency of technology use and toward studies that can isolate how, for whom, and under what conditions new technologies are influencing the lives of adolescents.

Impact of shared historical events

The early years of the 2020s brought on a combination of era-defining crises, including the COVID-19 pandemic, global conflicts, racism and racial injustice, inflation, and climate-related disasters that significantly affected the mental health and wellbeing of adolescents across the globe, particularly those with pre-existing mental health conditions (Santomauro et al., 2021) and/or who identify as racially/ethnically minoritized adolescents (Liu et al., 2023). Adolescents are particularly affected by the consequences of these global crises as they occur during a sensitive period of development in which universal stress exposure is likely to trigger mental health problems. Numerous studies have shown the pandemic had a profound negative effect on children and

adolescents, with more limited but growing evidence demonstrating the impact of the other crises (Ravens-Sieberer et al., 2022). Social isolation, fear of illness, and potential loss of loved ones has contributed to elevated anxiety and depression among adolescents (Almeida et al., 2021). Constant threat and instability have decreased feelings of safety and security and increased anxiety and worry about the future (Bürgin et al., 2022). Experiences of discrimination and microaggressions have fostered fear, anger, and distrust in authority figures, led to chronic stress and feelings of isolation, and exacerbated internalized negative stereotypes (Lass-Hennemann et al., 2023).

Researchers have also considered potential protective factors including self-efficacy beliefs and expressive flexibility. Self-efficacy beliefs are the beliefs individuals hold about their capacity to exert control over the events that affect their lives (Bandura, 1977). These beliefs influence whether an individual thinks in an enabling or a debilitating manner, the amount of effort they invest, how much they persevere in the face of difficulties, and their vulnerability to stress and depression (Caprara et al., 2008). Studies have established self-efficacy as a protective factor for adolescents during the COVID-19 pandemic (Scheiner et al., 2023). Additional findings suggest a negative association between climate anxiety and self-efficacy (Maran and Begotti, 2021; Scheiner et al., 2023). Similarly, expressive flexibility, or the ability to adapt to changing contextual demands by enhancing and suppressing one's one emotional response, has been found to significantly contribute to coping with long-term stressors. Studies with adolescents show that high expressive flexibility is associated with fewer negative psychological consequences of trauma (Fu and Chow, 2017).

Adolescent emotional development: Risk and resilience

Adolescence is a crucial time for emotion development, with overall emotion development and regulation making huge strides between middle childhood and adolescence. Understanding the role of emotion development in internalizing and externalizing symptomatology becomes all the more crucial, as the period of adolescence puts youths at a greater risk for developing certain types of psychopathology and symptomatology (Patterson et al., 2018). Emotion development and functioning has been implicated in both internalizing and externalizing symptomatology, as well as in many clinical disorders. Emotions play a powerful role in both psychological health and physiological health. For example, emotions can exert negative or positive effects on overall health in adolescents through physiological changes, such as increased heart rate or cortisol levels (Adam, 2006). Emotions can also affect psychological well-being through the effects of extreme sadness or joy on an individual's mood (Bailen et al., 2019). Positive emotions can buffer the effects of stress on adolescents, whereas negative emotions (in particular prolonged negative emotions) can exacerbate the effects of stress and negative life experiences (Andersen, 2003).

Emotion regulation and subsequent socioemotional development play important roles within overall adolescent risk and resilience. For instance, adolescents who report more intense and labile emotions and less effective regulation of these emotions report more depressive symptoms (Silk et al., 2003). Furthermore, good emotion regulation capabilities can act as a protective factor against trauma and other risk factors, whereas poor emotion regulation may act as a risk factor leading to more negative emotions, poor coping, and poorer social interactions (Daniel et al., 2020; Kim and Cicchetti, 2010). In particular, emotion regulation and emotional competence may act as adaptive factors in the face of adversity and may promote more positive coping strategies and thus healthy adjustment throughout development. For example, there is evidence that emotion regulation mediates the link between earlier child maltreatment and emotional adjustment outcomes such as anxious/depressed symptoms (Compas, 2004; Kim and Cicchetti, 2010). Two of the most studied adaptive and maladaptive emotion regulation strategies are cognitive reappraisal and rumination, respectively. *Cognitive reappraisal* often relieves discomfort by reframing the meaning of a situation in positive terms, which then changes the person's judgment of the situation and ultimately leads to beneficial effects on affect, self-esteem, and adjustment, as well as an increase in experiences of positive emotions and a decrease in experience of negative ones (Haga et al., 2009). In contrast, *rumination*, or thinking repeatedly about a negative event or emotion tends to trigger more negative emotions, depressive symptoms and fewer positive emotions (Zuzama et al., 2021).

Cultural research on internalizing and externalizing problems has predominantly focused on adolescents from different ethnic groups within the United States. Studies show racially/ethnically minoritized youth, such as African American, Native American, Latino American, and Asian American adolescents report higher rates of internalizing problems than European Americans (Anderson and Mayes, 2010). For example, higher levels of depressive symptomatology have been reported among both Black and Hispanic adolescents compared to White adolescents (Franko et al., 2005; Roberts et al., 1997). Additionally, Hispanic females have exhibited the highest levels of co-occurring symptoms (i.e., highest levels of both internalizing and externalizing symptoms across a wide range of specific symptoms; McLaughlin et al., 2007). In studies examining the prevalence of anxiety symptoms and frequency and intensity of common fears, White participants often endorsed lower levels of symptoms compared to Filipino, Native Hawaiian, and Asian American groups (Austin and Chorpita, 2004).

Studies examining aggressive behavior among representative samples of adolescents have often varied depending on informants. For example, in a study examining collecting data from three informants (adolescent, parent and teacher), Black adolescents were only rated as higher on aggression compared to Whites according to teacher report; no differences were found according to parent report; and White adolescents were rated as higher on aggression according to adolescent report (Fabrega et al., 1996; McLaughlin et al., 2007).

Recent research implicates racial discrimination and structural inequality as critically important mechanisms contributing to social, emotional and behavioral health disparities among adolescents of color (Neblett, 2019). Greater perceptions of racial/ethnic

discrimination have been linked to more depressive symptoms, poorer self-esteem, lower academic achievement and engagement, greater engagement in externalizing behaviors, and more associations with deviant peers (Benner et al., 2018). This is also evidence suggesting concerns of racial stigmatization may influence how different racial and ethnic groups manage their emotional displays. For example, Perry-Parrish and colleagues (2017) suggest Black children and adolescents may demonstrate lower levels of anger expressivity and higher levels of anger control compared to their White peers to counter pervasive stereotypes. Thus, experiences of racism and other forms of oppression alter developmental pathways to meet the developmental and self-actualization tasks prescribed to produce a healthy, thriving, productive adolescent.

Conclusions

A number of events unique to, or first experienced in adolescence, contribute to emotional development. The continuous and dynamic interplay of biological factors, environmental contexts, and social/cultural influences have important implications for the understanding, expression, and regulation of emotions across the life span, and play a particularly significant role in adolescence. Several studies have established the links between genes and behavioral outcomes in emotional development, including their bidirectional interactions, and there is also growing evidence establishing the neurobiological underpinnings and sociocultural mechanisms operating during adolescence (Bailen et al., 2019; Guyer et al., 2016). Increasingly, researchers are calling for a more nuanced understanding of the macro-level contexts, including culture, digital media use, and shared historical events, that individually and together exert favorable and unfavorable impacts on adolescent emotional health (Liu et al., 2023; Navarro and Tudge, 2023; Neblett, 2019). The variety of influences on emotional development and functioning are strongly tied to adolescents' well-being, as well as risks for developing behavioral and emotional problems and disorders that range from antisocial conduct problems to mood disorders such as depression (Compas, 2004). Importantly, there is a need to ground future research in intersectionality that underscores how identification with marginalized social categories influences emotional development and the extent to which it leads to adverse psychological health outcomes, poor mental health trajectories, greater exposure to risk factors, and less access to protective factors. Balancing between understanding risk and understanding conditions of thriving will lay the foundation for a future developmental science in adolescence that can optimize emotional development during this period of life.

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