The Current State of Research on Resilience, and Its Relationship to Education

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Abstract: Since the 1970s, the role of resilience has become increasingly prominent in the fields of psychology and education.This paper summarizes the relevant research literature at home and abroad, and discusses in detail the concept of resilience, developmental processes, neural mechanisms, and its influencing factors, and outlines the tremendous role that resilience can play in the field of education.

Keywords: Resilience, Developmental Processes, Neural Mechanisms, Influence Factors, Relationship with Education.

1.   Definition of Resilience

The sky is the limit, and a gentleman can never stop being strong. Resilience plays a huge role in our daily lives. When we are hit by life's shocks, such as a corporate business crisis, personal hardship of losing a job, or the sudden death of a loved one, some people remain calm during difficulties, while others are on the verge of collapse. The truth is that we usually have two choices in the face of difficulty: either we become enslaved to our negative emotions and become complete failures, or we recover from adversity and try to turn our pain into a stepping stone on the road to growth. The key to overcoming adversity is therefore resilience.

While there seems to be some consensus on what resilience is, there is no single way to define resilience. Depending on the perspective of resilience, researchers have come up with three different definitions of resilience: outcome, process, and trait.

The outcome definition of resilience considers resilience to be a phenomenon when individuals show positive adaptation despite an unfortunate or dangerous context [1]. This definition takes the perspective of psychological developmental outcomes and focuses on the fact that individuals are not negatively affected by adverse events after they have experienced them, but instead have positive developmental outcomes as a result. Process definitions view resilience as a dynamic process of developmental change, such that resilience is the process by which individuals use a dynamic interaction of a range of resources, including external support, abilities, and characteristics, to recover quickly and cope successfully when experiencing significant stress or threat [2]. A trait definition of resilience is the ability of an individual to experience disadvantage, endure disruptive change with fewer undesirable behaviours and recover from negative experiences as quickly as possible and adapt

well [3,4]. This definition views resilience as a human quality, an ability possessed by the individual that can be mobilized in time when the individual is in distress. Although definitions of resilience are diverse, the central question discussed by researchers is how individuals can withstand adverse events without causing negative physical and mental health consequences [5].

Specifically, two conditions must be met for a person to be considered resilient. On the one hand, there are dangers or adverse situations in the individual's living environment that threaten good developmental outcomes for the individual, and Masten and Coatsworth categorize dangers into three situations: chronic exposure to adverse social circumstances (e.g. poverty, domestic violence, racial discrimination, etc.), past or current traumatic events or serious disasters (e.g. divorce, car accidents, major illness, etc.), and a combination of both of these [6]. On the other hand, the individual also needs to be able to cope 'okay' or 'well' in the face of danger [7]. Researchers have widely accepted these two conditions as prerequisites for determining resilience, but there is much debate about the criteria by which individuals are judged to be 'okay'or 'well'. Many developmental psychologists define children in terms of social or cultural expectations of their behavior and consider them to be well developed as long as their development meets these expectations. These expectations include salient developmental tasks described in graduated developmental theory, corresponding standards of competence, and cultural age expectations [6]. Other researchers working in psychopathology use the presence or absence or the number of psychopathological symptoms as a criterion for assessing whether development is good [8]. Thus, as defined by these criteria, resilience is not universal in the population, i.e. while everyone may be well developed, not everyone has resilience.

2. The Development Process of Resilience Research

The study of resilience has been around since the 1970s and psychologists have conducted research from several number of perspectives, including protective factors, dynamic processes, and development in the context of new thinking. The content and process of these studies can be broadly divided into three phases.

2.1. Early (1970-1990) - The Stage of Proposing Resilience and its Protective Factors

Emmy Werner, the mother of resilience research, and her colleague Ruth Smith first began studying and longitudinally tracking the development of 700 children born on the island of Kauai (in Hawaii) between 1955 and 1995 [9,10]. One-third of these children were considered to be at higher risk for academic and social problems at birth because of the disruptive nature of their home environment (e.g., poverty, domestic violence, etc.). However, disruptive factors did not cause harm to 1/3 of them. Further research revealed that these children had two characteristics: (1) they were naturally extroverted; and (2) they developed good personal attributes and had readily available social support resources (e.g. they had good intelligence, self-esteem, and positive self-perception; and received positive attention and good care from family members during infancy). The remaining 2/3 of the children did experience some social problems during adolescence, but most of the participants reported having 'recovered' from their childhood experiences by the age of 35 or 36, where they were found to have grown up with a strong physical body, good adaptive and communication skills, and a high sense of social responsibility. Based on these findings, Werner et al. argue that aspects such as individual traits and social support factors can protect against the development of individual resilience. Therefore, she developed the concept of protective factors for resilience, categorising the aforementioned traits as protective factors for resilience. Werner also suggests that supportive family environments (e.g. love, tolerance, acceptance) and external support systems can also play a protective role in children's coping with difficulties.

Based on these findings, the early focus of the researcher was on the differences between individuals who showed well-adjusted success in the face of the same distress and those who developed psychological problems, as well as the different traits and protective factors that may be at play [11].

2.2. Mid-term (1990-2000) - A Phase of Cross-dynamic Formation Processes Concerned with Resilience
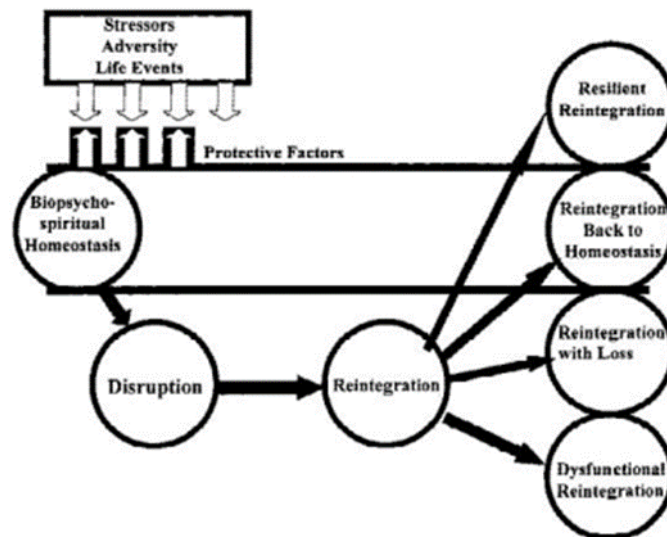

Figure 1: Process model of resilience.

Following the identification of protective factors of resilience, researchers have turned their attention to how these protective factors play a role in resilience when it occurs, and how they help individuals to restore their state by eliminating risk factors. Thus, in the mid-stage of resilience research, scholars began to examine the interaction between resilience and the individual's own psychophysiological and mental state, as well as environmental and social support.

Richardson hypothesised that there is a 'state of mental and physical equilibrium' within the individual. Protective factors work because they stimulate the body system's ability to maintain homeostasis when adversity affects it, a process that he summarises as a model of resilience (see Figure 1) [12]. The core of this model is the individual's dynamic equilibrium. In this model, the interaction between events that threaten the individual and protective factors determines whether an imbalance in the system will occur. If the protective factors are unable to resist the impact of a dangerous life event, there is the potential to disrupt the individual's equilibrium. As the dynamic equilibrium is disrupted, the individual undergoes a process of conscious or unconscious restructuring, which usually takes place in one of four ways: 1) Resilience restructuring, where the individual's physical and psychological state is not only restored to its original level but is also enhanced from its original state, which promotes growth and self-understanding; 2) Regressive reorganisation, where the individual returns to the same level of physical and mental well-being as before the setback; 3) Deficit reorganisation, where the individual achieves a new balance but loses some of the ideals or beliefs he or she held; 4) Dysfunctional reorganisation, where the individual is unable to cope with difficulties and chooses drugs or risky behaviour to numb himself or herself to avoid coping with dangerous life events. The value of this model is that it is a reminder that resilience is the result of a conscious choice, as opposed to 'recovery' in the ordinary sense. Of course, individuals are often not confronted with a single stressor, and multiple stressors often interact with each other to produce

cumulative effects. Thus, at each stage of development, there is a constant battle between protective factors that enhance resilience and dangerous stressors that exacerbate vulnerability, and the individual can only maintain a good balance when the protective factors are at a strong turning point [12].

2.3. Late Period (2000-present) - Emphasis on Resilience in the Context of Positive Psychology

The ideology of positive psychology promotes a tolerant and accepting outlook on everyone. Every person has inherent positive strengths, and anyone can to recognize their strengths and weaknesses, maximise their inner resources, develop positive psychological qualities, and stimulate positive strengths to overcome setbacks and difficulties in their development, thereby achieving a happier and more meaningful life [13]. As a result, researchers have moved away from the goal-oriented approach of simply identifying illnesses and solving problems, and instead advocate a positive approach to exploring the positive qualities of human beings, tapping into their inherent potential psychological energy and encouraging people to look beyond the pursuit of a happy life to promote the harmonious development of people and society [11]. Positive psychology assumes that everyone has an intrinsic need for a stable and peaceful state of life, and that when developed as a psychological resource, resilience contains energy that is forward-looking and acts as a driving force for individuals to interact with their environment in the face of future adversity, helping them to grow [14].

In this context, researchers have begun to explore the new topic of resilience: since it is beneficial to people's healthy physical and mental development, is it possible to cultivate resilience as people's psychological energy to exert a preventive effect, potentially helping individuals to be well prepared when dealing with possible difficulties in the future. As a result, the development of resilience has shifted from a previous focus on how people behave in the face of disaster to a focus on how to proactively use resilience as a positive trait to prevent or deal with problems and provide a protective effect.
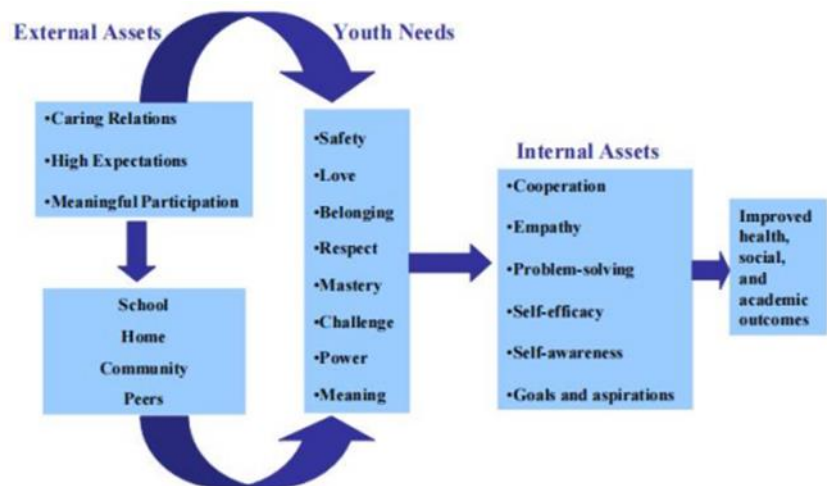

Figure 2: Dynamic model of resilience.

Researchers have proposed a new explanatory model of resilience (see Figure 2). The model suggests that resilience is a potential that adolescents are born with. Adolescents develop psychological needs such as safety, love, belonging, respect, control, challenge, competence, and value, and the fulfillment of these needs depends on protective factors or external resources from school, family, society, and peers, including close relationships, high expectations, and active participation. If external resources create the conditions for adolescents to meet their psychological

needs, adolescents will naturally acquire individual characteristics, including cooperation, empathy, problem-solving, self-efficacy, self-awareness, self-awareness, goals and aspirations, which constitute their internal resources. These internal resources will help adolescents to navigate through periods of confusion and promote healthy development by mitigating the significant harm they may experience in future adversity [15].

3. Neural Mechanisms of Resilience

Nowadays, although resilience is a powerful tool for coping effectively with stressful and frustrating events, it is still a complex, multidimensional structure influenced by the internal and external interactions of the individual. Understanding the neural mechanisms of resilience and brain activity is important for understanding the mechanisms and trajectories of resilience to facilitate resilience training and development.

Thanks to modern research techniques, brain imaging, represented by Functional Magnetic Resonance Imaging (fMRI), is widely used in the study of brain mechanisms of resilience. It has been found that most people manage to maintain normal mental and physical functioning and avoid serious mental illness even when exposed to significant stress and trauma, precisely because human resilience functions as an active, adaptive process in the brain [16-18]. Researchers have suggested that brain regions such as the medial prefrontal cortex (mPFC), anterior cingulate cortex (ACC), and amygdala are all implicated in the formation and maintenance of resilience [19,20].

Increased positive emotion regulation triggered by the medial prefrontal cortex (mPFC) may underlie individual resilience [21]. In a post-traumatic stress disorder (PTSD) study, the non-PTSD group showed the highest activation of the mPFC, followed by the healthy control group, while the PTSD group showed the lowest activation of the mPFC [22]. Researchers suggest that this mechanism can support individuals with high resilience to effectively navigate through periods of stress and return to normalcy [23]. Furthermore, the mPFC can influence stimulus-induced emotional responses such as stress and fear by modulating neural activity in the amygdala [24]. Thus, neural activity in the mPFC may be one of the relevant neural bases for resilience, particularly in response to trauma.

Studies in the cingulate region of the brain have shown that neural activity in both the anterior cingulate cortex (ACC) and the subgenual anterior cingulate cortex (sgACC) is associated with resilience. The ACC is mainly involved in individual emotional processing and conscious emotion regulation, especially the elimination of fear responses [25]. Individuals with high resilience are generally better able to regulate and manage their emotions, and their ACC brain regions are better able to suppress negative emotions, thus enabling them to better manage negative emotions and respond appropriately to negative situations [26]. In addition, the structure of the ACC brain region also reflects an individual's level of resilience. The ACC cortex is significantly thinner in individuals with PTSD compared to normal individuals [26]. Thus, both the structure and function of the ACC brain region are related to resilience, and may be another important neural basis for resilience. On the other hand, sgACC is also thought to be associated with resilience and is primarily involved in emotional processing in stressful situations [21]. Studies of the sgACC in individuals with PTSD have shown that the level of neural activity in the sgACC increases as PTSD symptoms gradually improve, suggesting that the neural activity in the sgACC reflects the strength of the individual's resilience [27].

In addition, the activity of the amygdala is an important basis for resilience. The amygdala is an important centre for emotional processing, and studies have shown that fearful stimuli can activate the amygdala to a greater extent and are therefore important for alerting to dangerous information [28,29]. However, it has also been found that not only fearful emotional stimuli but also other emotional messages such as happiness, anger, and sadness can activate the amygdala [30]. Individuals with greater amygdala activity also have a greater ability to regulate learned responses to fearful

conditions [31,32]. These factors all suggest that individuals with stronger amygdala activity have a greater capacity for resilience. This finding is also consistent with related research. For example, it was found that individuals exposed to early adverse life events or abuse had lower resilience capacity than individuals without a history of childhood abuse, as well as smaller amygdala volumes [25,33]. Also, smaller amygdalas than normal children have been observed in individuals with poverty and adolescents with a history of childhood abuse [34,35]. On the other hand, in individuals who are chronically exposed to difficult situations and need to remain resilient for long periods, the grey matter volume in the right amygdala is larger than in individuals who are not resilient for long periods [25]. This suggests that it is a common characteristic of resilient individuals to regulate their emotions through the amygdala, limiting the degree and duration of activation of stress circuits and thus avoiding the effects of prolonged traumatic experiences [36].

4.   Factors Influencing Resilience

Resilience is a dynamic process of change in which individuals possess internal and external protective factors against external threats. It is therefore particularly important to explore the factors that influence the development of resilience in individuals. The internal protective factors of resilience refer to the individual's psychological abilities and personality traits that have protective factors, while the external protective factors refer to the environment outside the individual and resources that can help the individual adapt well, such as family, school and community [37,38]. Appropriate functioning of protective factors can effectively reduce the harm caused by risky events and increase the likelihood that individuals will adapt well to their environment.

4.1. Individual Factors

Researchers have suggested that intra-individual factors such as helpfulness, strong independence positive tendencies, optimism, aggressiveness, self-confidence, self-esteem, self-identity, and self-efficacy can influence resilience, but empirical research is still lacking, with existing studies focusing on personality traits and gender factors [37].

4.1.1. Personality Traits

Research has shown that the emotionally stable-neuroticism trait of personality is most closely associated with the individual's ability to regulate emotions in response to external stimuli and that this innate personality trait shows individual differences in mental toughness [39]. For example, individuals with high neuroticism are highly unstable and overreact to stimuli, with depression, anxiety, stress, and agitation being the main characteristics. These individuals can easily become trapped in difficult situations and suffer from negative emotions, and are therefore unable to mobilise their resilience to cope with difficulties. Emotionally stable people, on the other hand, show mild and slow emotional reactions and regain calm easily, will have greater self-control and are less prone to anxiety. They are likely to be more aware of themselves and to be on the lookout for stressful events that may occur around them in their lives, and take precautions in advance.

4.1.2. Gender Factors

Many studies have shown that there are gender differences in the development of individual resilience, with girls having significantly higher levels of resilience than boys, but differences in specific aspects of resilience vary between girls and boys [40,41]. In a study of parent-child attachment and resilience among migrant children, Mao and Wang found that girls had significantly higher levels of resilience in goal focus, emotional control and interpersonal assistance than boys; there were no gender

differences in positive cognition and family support [42]. In a study on the relationship between resilience and subjective well-being among high school students, Jiang and Li found that there was no significant difference in the overall resilience performance of males and females, but males were significantly more able to control their emotions than females, while females were significantly more able to assist interpersonally than males [43].

4.2. Environmental Factors

4.2.1. Family Factors

A warm parental role in the family and a harmonious family atmosphere, regular family gathering time, and parents who are tolerant, respectful, and unconditionally accepting of their children are conducive to the promotion of healthy psychological development. The development of resilience is profoundly influenced when parents adopt a form of equal communication and see the child as a thinking, whole and independent individual rather than an appendage [11,44]. At the same time, protective factors such as good interaction not only between parent and child but also between family members, family cohesion and attitudes towards important matters in the family, also help to provide individuals with stable support during future crises, giving them strong and enduring beliefs and the ability to live a good life in control [45].

4.2.2. School Factors

Researchers suggest that help from the outside world can provide individuals with hope and the resources they need to succeed. In the aftermath of a tragic experience, support from the outside world can reduce negative reactions, counteract some of the disadvantages and increase the individual's psychological resilience to cope with later developments in life. For example, for children who have experienced parental loss, positive attention from teachers can greatly reduce the negative effects and help children recover from adversity. Thus, an open and inclusive school climate and students' positive enjoyment of school life, developing good teacher-student relationships with teachers and maintaining warm peer relationships with classmates play an important role in the development of resilience [46]. Teachers are often the first person that children connect within society, apart from their parents, so their role often has a profound impact on students' perceptions and attitudes towards the world [47].

When teachers are patient and responsible, encourage and guide children into school, and build strong relationships of trust with students, their thoughts and behaviours can play a significant role in the psychological resilience of children and young people.

4.2.3. Community Factors

In addition, helping children and young people to grow up healthily also requires the participation of the whole community. This is why it is important to emphasise the close links between families, schools and the community. The community needs to focus on building a professional social workforce and provide regular educational sessions on difficult topics to support individuals in their mental health skills, emotional management and problem-solving. Social workers need to guide people to view negative life events such as stress, frustration and trauma positively, as these initiatives have an important impact on the development of resilience [48].

5. The Relationship between Resilience and Education

With the advent of economic society, life is renewed and iterated faster and faster, yet the wide range of psychological problems of students in the field of education has quietly surfaced. Questions are

often asked: Why is it that society has progressed and the economy has developed, but our students' sense of joy and happiness has not increased? Why do parents who care so much about their children's growth not receive their children's gratitude? Why are children so psychologically fragile today when material conditions have improved so much? Because of our lack of attention, many children's psychological problems are only revealed when they are extremely serious, by which time the child may have already experienced irreversible lifelong damage, so our past pursuit of academic achievement should no longer be imposed on our children. The all-around development of a student should include not only physical and intellectual development but also psychological well-being. Therefore, education needs to pay attention to the emotional world of children and the mental health of students as early as possible, and the findings of the study on resilience give some reference to how education can prevent psychological problems in students. Based on the seriousness and urgency of the current psychological problems of the adolescent population, this paper focuses on the adolescent population as the target audience for education.

5.1. Infiltrate Resilience Education in Educational and Teaching Activities to Develop Positive Psychological Traits in Young People

Teachers of various subjects can consciously and purposefully cultivate students' resilience in the actual process of teaching [13]. For example, Chinese teachers encourage students to write about their emotional feelings and changes in the form of a mood diary. The process of writing is a reflection of students' emotional expression and awareness of externalization, and in the process of writing students express their experienced emotions in the form of words, which not only reduces the pressure brought by negative emotions, but also develops students' ability to reflect on their own emotions, thus acquiring the ability to self-manage their emotions; Mathematics teachers can follow students' paths when answering difficult questions, so that they can move from initial bewilderment to finally conquer the problem and experiencing the way of thinking they should adopt when faced with a difficult problem. Teachers should also modify the specific content of the curriculum to take into account the actual situation of students at each grade level, helping students to improve their self-understanding and establish a positive outlook on life and frustration; guiding students to learn to manage their emotions, set reasonable goals in the learning process, adopt scientific and effective learning strategies, and improve their learning efficiency; and conducting interpersonal counseling to improve students' interpersonal skills [49]. The ultimate aim is to enhance students' resilience and promote their mental health.

5.2. Enhancing Students' Positive Emotional Experiences in Extra-curricular Activities

Resilience theory suggests that individuals experiencing more positive emotional experiences can contribute to improving students' resilience levels. Enriching extra-curricular activities can help enhance students' positive emotional experiences to improve their resilience levels [13]. Therefore, while classroom education is important to students, extra-curricular activities are also an integral part of their school life. For example, science and technology culture and art festivals, mental health education months, school sports days, poetry recitals and various forms of activities are organised to enrich students' extra-curricular life, reduce their academic load and encourage them to experience more positive emotions in rich campus culture.

5.3. Conduct Educational Activities on the Theme of Resilience (e.g. frustration education) to Develop Young People's Resilience to Setbacks.

While in the past the concept of mental health education was to solve problems when they arose, today mental health development places more emphasis on prevention for the future. However,

resilience is not something that everyone is born with, it requires some training and some shaping[50]. In school education, in addition to traditional subject education and extra-curricular activities, it is particularly important to have a dedicated mental health teacher and a special mental health education curriculum. For example, group counseling sessions are introduced. In a good atmosphere where group members play and interact, individuals can try to adopt new behavioural patterns in the group and improve their psychological adaptation [51,52].

Educators believe that there must be frustration education in educating children, and that they should not just satisfy him or suppress their nature, while frustration education means that the educated person should suffer from frustration in the process of education and recognise the importance of frustration to stimulate their potential [38]; the purpose of frustration education is not simply to suffer, but to learn to face difficulties and overcome setbacks, to build self-confidence and optimism, and to develop the ability to withstand setbacks [38].

Frustration education is in fact about providing good psychological energy to the educated person. It is necessary to prepare these energies in advance in their bodies and minds. In addition, when dealing with students' psychological problems daily, teachers should also be aware that positive potential is limited and that frustration educating also requires a suitable point, which varies from child to child and is within the child's "jumping reach", i.e., the extent to which the individual can reach and do something based on what he or she already has [37,38]. The more appropriate the development of resilience, the better it is for the child's future growth. Too much rigidity is easy to break, but good flexibility will never fail. Let children learn to rely on themselves, build confidence, learn self-motivation, exercise self-improvement and finally overcome setbacks.

5.4. Emphasize the Role of Peer Support and Strengthen Joint work between Home and School

As an external protective resource at school, peer relationships are also an important psychological resource in adolescent development and have an irreplaceable place in the development of resilience [13,37]. Due to the rapid physical and psychological development of adolescence, adolescents spend much more time at school than they do with their parents, so they are more willing to talk to their classmates and friends when they encounter troubles, and it is easier for them to establish a trusting relationship with their peers.

Teachers can set up psychological committee members, "big sisters" and small angels in the classroom to provide support through peer support. At the same time, schools can conduct regular talks on parent-child education in the context of resilience, hold seminars on mental health and set up "family mental health hotlines" to raise parents' awareness of their children's resilience levels. Parents are encouraged to report their child's mental health level to the school teachers and to communicate with them to learn how to get along with their child, so that the school and the family can become a strong barrier to their child's education.

In today's multicultural context of social transition, it is a challenge for individuals, especially students, to cope with the various difficulties and setbacks they encounter in the course of their development. As educators, we must not only help students to cope with this problem when it arises, but also use a forward-looking perspective to prevent them from encountering dangerous events that may lead to psychological problems in the future.

Resilience plays an important role in positive coping with disadvantage through a range of protective factors. Future research in this area can be further developed to better understand the laws of human development and to formulate sound and effective developmental strategies for youth mental health education.

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