Resilience: Causal Pathways and Social Ecology

3

Michael Rutter

During recent years, there has been a marked tendency for researchers, clinicians, and policymakers to shift their focus from risk to resilience (Mohaupt, 2008). Part of the motivation for their shift was a wish to emphasize the positive, rather than always concentrating on maladaptive outcomes or psychopathology. The aim was to be the fostering of success, instead of treating failure. The emergence of positive psychology as a major movement represents this goal most clearly (Seligman & Csikszentmihalyi, 2000). In the UK, Layard's (2005) "happiness" agenda constitutes an extreme example of the same concern. Several points need to be made. First, it fits firmly into the "risk" paradigm; it merely concentrates on the positive, rather than the negative, pole. Insofar as that is so, it mainly constitutes a relabeling. Instead of studying the risks associated with family conflict, the protective effects of family harmony can be the focus. Instead of investigating depression, happiness is studied. Of course, the shift would be real and not just semantic, if it could be shown that the influences fostering positive outcomes were not just the opposite of those predisposing to negative outcomes. However, few such examples have been found. In their absence, there is the real risk of trivializing the public and private health importance of serious mental disorder.

Many would argue that there can be little justified interest in whether this person without mental disorder is, or is not, happier than some other person without mental disorder. In addition, the focus runs straight into all the empirical and methodological problems associated with "positive mental health" in an earlier era (Jahoda, 1959). How do we differentiate hedonistic pleasure and excitement from the quiet satisfaction of a job well done? Should Italian President Berlusconi's alleged preoccupation with young girls and with paid call girls be viewed as a positive attribute because it gives him pleasure? What about former US President Bush and British Prime Minister Blair's seemingly smug, satisfied, guilt-free complicity in torturing prisoners and invading Iraq on a lie? Is a positive personal outcome something to be deplored or welcomed in these circumstances?

Another, somewhat different, concept is that of psychological and social competence (Masten et al., 1999). That is different in the sense that it is potentially quantifiable. However, it suffers from three important limitations. First, it assumes that the causal influences will be the same in the nonstressed general population as in those suffering adversity. That could turn out to be true, but it has to be tested and not assumed. Secondly, it assumes that the outcomes will be explicable on the basis of the balance between risk and protective factors; in other words, the concept is firmly based in the risk tradition. Third, it assumes that

M. Rutter (✉)
The Social, Genetic and Developmental Psychiatry Centre, Institute of Psychiatry, King's College London, London, UK
e-mail: camilla.azis@kcl.ac.uk

M. Ungar (ed.), *The Social Ecology of Resilience: A Handbook of Theory and Practice*,
DOI 10.1007/978-1-4614-0586-3_3,

all individuals will respond in the same way to the same degree.

For all these reasons, resilience differs fundamentally from concepts of positive psychology and of competence. Its starting point is quite different in that it begins with the universal finding from all research, naturalistic and experimental, human and other animals, that there is huge heterogeneity in the response to all manner of environmental hazards, physical and psychological (Rutter, 2006). It is argued that systematic investigations of the causes of this heterogeneity should not just throw light on the specifics of different responses to a specific hazard but, in addition, might throw light on a broader range of causal processes. As we shall see, this concept necessarily brings with it several other differences.

Definition of Resilience

It is generally accepted that resilience is defined as a relative resistance to environmental risk experiences, the overcoming of stress or adversity, or a relatively good outcome despite risk experiences (Rutter, 2006). In other words, it is an interactive concept in which the presence of resilience has to be inferred from individual variations in outcome in individuals who have experienced significant major stress or adversity. The inference of resilience requires a demonstration that the effects differ from those found in the absence of such stress/adversity. Note that this concept means that resilience cannot be viewed as a trait that is open to direct measurement.

Does This Mean That Resilience Can Be Reduced to the Finding of a Statistically Significant Interaction Effect?

There are three main reasons why this is not justifiable. First, a statistical interaction requires variations in both variables and not just one. The importance of this point is that some environmental hazards are population-wide. Thus, in the parts of the world in which malaria is endemic, everyone is subject to a broadly similar exposure. Nevertheless, some are relatively resistant and many are not. That would not be detectable through a statistical interaction because there is so little variation in malaria exposure. Exactly the same applies to hay fever in the UK. More or less everyone receives the same exposure to pollens in the spring but some individuals are resistant to hay fever, whereas others are not. That is a biological gene-environment interaction, albeit not a statistical one.

Is Resilience Merely Another Word for Successfully Coping?

Certainly, resilience and coping are closely connected concepts. In particular, unlike most risk research, the emphasis is on an active *process* and not static traits. Nevertheless, the two are not synonymous because coping is essentially an *individual* feature, and moreover one that implies some overt action. As we shall see, that is an important component of resilience but it is not all. In particular, it ignores the social context and social influences, both of which can be very influential.

Insofar as Resilience Involves Coping, Is It More Likely That There Will Be Substantial Continuity Over Time and Place?

Of course, a degree of continuity is expectable on the basis of the role of individual traits. Nevertheless longitudinal studies of temperament and personality show only moderate continuity (Caspi & Shiner, 2008). Also, if social context or life situation change, there are likely to be impacts on resilience. More directly, empirical studies (discussed below) show that the genetic affects on environmental susceptibility to the same hazard (child abuse) differs according to whether or not the outcome being studied is depression or antisocial behavior. For obvious reasons, it is implausible that the resilience to infections, to cancer, to heart disease, and to maltreatment will involve identical mechanisms.

Even with the Same Hazard and the Same Outcome, Can Resilience Be Reduced to a Unitary Factor?

It cannot be so reduced because resilience may show itself in the form of either resistance to stress/adversity or "steeling" effects in which individuals are actually strengthened by a bad experience. Although possible, it is not likely that these two different outcomes will involve exactly the same causal processes.

Can Resilience Be Reduced to the "Chemistry" of the Moment?

It cannot be considered just as something that applies at a single moment of time. That is because resilience may derive from factors operating before the environmental hazard occurs, from those acting during the experience, and from circumstances years later that affect recovery. A lifetime perspective is essential and resilience is best considered as a dynamic process rather than the occurrence of an event.

Is Resilience No More Than a Fancy New Name to Re-label the Well-Established Traditional Concepts of Risk and Protection?

No, because the two are fundamentally different in both their starting point and their assumptions. The concepts of risk and protection focus on group differences predicated on the assumption that, broadly speaking, all individuals will respond in much the same way. Accordingly, the causal factors will be found to reside in the balance, and severity, of individual risk and protective factors, and these will apply to the whole population.

By contrast, resilience starts with the assumption (firmly based on good empirical evidence) that, given the same dose and pattern of stress/adversity, there will always be marked heterogeneity in response. Analyses, therefore, focus on the range of possible influences giving rise to that heterogeneity. The expectation is that the answers will be informative on the causes of these individual differences and the hope is that these findings will be more broadly applicable to the causal process more generally.

Does This Mean, Therefore, That We Should Abandon Research into Risk and Protective Factors, and Instead Focus Just on Resilience?

Certainly not! The reason is that the whole approach to the study of resilience has to start with a careful, rigorous quantified measurement of risk and protection. That is because an essential methodological requirement is that the reality of major risk has been firmly established and quantified in order to ensure that the heterogeneity of response is examined in relation to a standard baseline. It needs to be added, in addition, that a substantial proportion of individual differences *does* reflect the balance between risk and protective factors. The concept of resilience does not deny that but, rather, adds an additional crucially important element. A further requirement is that research should have established that the risk is truly environmentally mediated. The concept of resilience is equally applicable to genetic risks but, in this review, the focus will be strictly on environmental hazards.

Does the Concept of Resilience Have to Apply to Individuals; Can There Be Resilient Communities?

Although there could be resilient communities (and an example will be discussed) it is difficult to know what *community* outcome could be used as an index. It is certainly appropriate to conceptualize *influences* at a community level, but resilience as an outcome is still better viewed in terms of individual outcomes, and that is the approach used here.

Steeling Effects

With these background concepts in mind, attention needs to be focused on the occurrences of "steeling" effects – meaning circumstances in which individuals are actually strengthened by the experience of challenge, stress, or adversity. Conceptually, it needs to be recognized that coping with challenge is a normal feature of development. Biologically speaking, it would make no sense to seek to rear children with the aim of a total avoidance of environmental hazards. The medical example of resistance to infections constitutes the best example. Good physical health is not fostered by avoiding all contact with infectious agents. Rather it is fostered by encountering such agents and dealing with them successfully (the acquisition of natural immunity), or by immunization in which a controlled dose of a modified version of the pathogen is administered (thereby providing induced immunity).

The key question is whether something comparable applies to psychological stresses. Perhaps, although not as extensively studied as would be desirable, the most direct parallel is provided by the physiological adaptations found in experienced parachute jumpers (Ursin, Badde, & Levins, 1978). Novices, not surprisingly, show high arousal immediately prior to jumping. By contrast, experienced jumpers show a different, adaptive, physiological response well before jumping. There is no obvious social contextual influence but, of course, there is a protective camaraderie in being part of a cohesive group of successful "experts."

The second contextual effect is seen more clearly in the high morale shown by soldiers working in conditions of extreme danger in the Vietnam War but undertaking a crucially important task and taking pride in doing so well (Bourne, Coli, & Datel, 1968; Bourne, Rose, & Mason, 1967). In this instance, although not experimentally tested, it seems reasonable to conclude that their resistance to the stresses of severe danger derived from the particular features of their social group.

A rather different example stems from Elders' longitudinal analyses of the California cohorts going through the economic depression of the 1920s and 1930s (Elder, 1974). In brief, the relevant finding was that whereas younger children tended to fare poorly, adolescents were sometimes strengthened by the experience. The proposed explanation was that those of greater maturity and experience were better able to take on new social responsibilities, and finding that they could do this successfully made them more resilient.

The early finding that children who experienced happy separation from their parents (such as by staying with grandparents or having "sleepovers" with friends) tended to cope better with the stresses of hospital admission (Stacey, Dearden, Pill, & Robinson, 1970). Of course, admission to hospital involved multiple stressful events other than separation. Nevertheless, the acquired social confidence and self-efficacy deriving from successful social experiences seemed to foster resilience.

Yet another example is provided by the evidence that, for girls raised in group care institutional conditions, success at school (usually not academic, but including success in positions of responsibility or in sport or in music) left them with a feeling of control over their lives that was sorely lacking in most of the institution-reared group (Quinton & Rutter, 1988).

Two points need to be emphasized. First, the findings are necessarily somewhat speculative in their implications. Second, it would be quite wrong to suppose that all steeling effects necessarily involve social contextual influences. The best example of one that does not is to be found in Levine et al.'s rodent studies (Levine, 1956; Levine, Chevalier, & Korchin, 1956). Physical stress was experimentally induced by putting the animals in a centrifuge that spun them around. Counter to expectations, this unpleasant experience had both structural and functional effects on the neuroendocrine system that were associated with an enhanced resistance to later stresses.

Only the most tentative inferences are possible on the qualities associated with "steeling" effects.

But such evidence as there is suggests that physio logical adaptation and psychological habituation are both involved and that successful coping with the challenge or environmental hazard is more likely when there is a sense of self-efficacy, the acquisition of effective coping strategies and a cognitive redefinition of the negative experience.

Communities Fostering Resilience

Three community examples serve to make the same point. First, the Chicago study undertaken by Sampson, Raudenbush, and Earls (1997) showed that crime was highest in geographical areas showing social disorganization and a lack of collective efficacy. In other words, area differences in crime were not mainly a result of noxious influences pushing individuals into crime but rather reflected a lack of a positive social ethos in the community that, when it was present, protected individuals in a high risk area from engaging in crime. The more recent study by Odgers et al. (2009), although using rather different measures and a quite different type of sample, similarly identified collective efficacy as the quality seeming to foster resilience.

The third example was different yet again, but despite this, pointed to similar mechanisms. Bruhn and Wolf (1979, 1993) noted that in a small town, Roseto, in Pennsylvania the death rate from heart disease was roughly half that in the United States as a whole and about a third of that in two apparently similar towns also largely made up of hardworking European immigrants. The differences did not appear to stem from variation in diet, exercise, or family history. What they found was that the Rosetons had created a powerful protective social structure, which was egalitarian in helping the unsuccessful and discouraging the wealthy from flaunting their success. In a town of just under 2,000 people there were 22 separate civic organizations, many multigenerational homes in which the grandparents were respected, a cohesive Catholic church group and a tendency for people to visit one another, stopping to chat in Italian on the street or cooking for one another in their backyards. This constituted a powerful, but highly unusual, example of collective efficacy that seemed to foster both physical and mental health (Gladwell, 2009).

Opportunity, Practice, and Multiplier Effects

Gladwell (2009) has brought together an important set of concepts and findings on outstanding economic success. Although that is far from synonymous with psychosocial resilience, it nevertheless provides three key messages that do apply to resilience. First, there is the role of some unexpected opportunity. Gladwell drew attention to the observation that a surprisingly high proportion of ice hockey stars were born in the first 3 months of the year. The cut-off for selection to a junior squad who received special coaching was January first. This means that those who were oldest, and therefore physically most mature, had a big advantage within the 1 year cohort over those who could be up to 12 months younger – a huge age gap in preadolescence. A comparative effect is also evident in scholastic success (Bedard & Dhuey, 2006).

The striking aspect of this age advantage phenomena is its remarkable persistence (see Misch & Grondin, 2001). This is because the initial opportunity led on to a markedly superior experience – the crucially important multiplier effect. In addition, this led to a much greater duration of practice. This led to the so called "10,000 rule" – the notion that an outstanding expert performance is only possible with an extraordinary duration of deliberate practice (see Ericsson, Krampe, & Tesch-Römer, 1993). This was most closely examined in the fields of sport and music but perhaps the same may apply in the field of social functioning.

Family Fostering of Talent

Many people have a strong belief in the importance of native ability, as indexed by IQ, in predicting world success. The most famous example

of a study designed to examine this notion was Terman's longitudinal study if 730 young boys with a measured IQ of at least 140 (ranging up to 200) (Minton, 1988; Seagoe, 1975; Shurkin, 1992). In adult life, about a fifth of these Termites (as they came to be known) were outstandingly successful by any criterion, but a fifth were strikingly unsuccessful. A third of the latter group dropped out of college and most were struggling in their work. Strikingly, the successes and failures did not differ in IQ. The differentiation lay in the fact that the former overwhelmingly came from upper middle class families whereas the latter did not (indeed about a third had a parent who dropped out of high school before the eighth grade). Did the difference reflect genetic or cultural advantages/disadvantages? We do not know, but a very small scale qualitative study of third graders provides possible clues. Lareau (2003) made a differentiation between families that provided what she called "concerted cultivation" and "accomplishment of natural growth." The former involved active parental scheduling of the children's activities, an expectation that children talk back to adults in order to negotiate and question, and a fostering of a sense of entitlement. The latter were equally caring but differed in having a style that let children grow and develop on their own. Children were expected to be compliant and obedient and there was no fostering of active entitlement. The design allowed no testing of causation but the suggestion was that success involved not only the ample provision of active learning opportunities but also a style of encouraging curiosity and an expectation of being respected and listened to.

Value of Meaningful Work

There are striking national differences in mathematics and science achievements as shown by the TIMSS comparative study (see Gladwell, 2009). These differences parallel similar contrasts on the willingness to work hard over long hours. But for work to be satisfying, meaningful, and worthwhile, it seems also necessary for there to be autonomy, complexity, and a clear connection between effort and reward. Although, once again, whether these associations reflect causal influences, the experience of successful immigrants does to appear to show these features.

Schooling

The studies of effective schooling (Rutter, Maughan, Mortimore, Ouston, & Smith, 1979) add further dimensions. It is clear that the sheer number of hours spent at school overall (roughly estimated as 15,000 h) makes it evident that there is ample opportunity for schooling to make an important impact on young people's progress. Comparison of effective and less effective schools (as judged by pupil success) showed the value of an appropriate academic emphasis and of high expectations, but the findings also pointed to the crucial role of social experiences. Children fared better when treated well, given responsibility and multiple opportunities for success in varied fields, and the teachers provided models of conscientious behavior and an interest in and positive response to pupils' work and other activities. Academic success tended to be associated with good attendance and good behavior, and the qualities already noted in relation to post-school employment (autonomy, complexity, and rewards) apply equally in the school environment. The findings show that the school ethos *will* affect social functioning simply because it constitutes a social group as well as a pedagogic institution. It is not a matter of schools choosing to target social functioning; rather the issue is whether the social group (both in terms of teachers and pupils, and the mix of the peer group) will have a beneficial or damaging effect. However, it is also relevant that upper SES children tend to progress during the long summer vacation, whereas lower SES children do not (Alexander, Entwisle & Olson, 2001). This suggests an important compensatory role of schooling.

Turning Points in Adult Life

Resilience is often seen as something that develops in childhood but two examples illustrate the importance of turning point effects in adult life.

Both also show the value of combining quantitative and qualitative research strategies. Hauser, Allen, and Golden (2006) followed into adult life 67 young people who were patients in an inpatient psychiatric unit when adolescent. The qualitative study compared nine who showed outstanding resilience and seven with "ordinary" outcomes. The researchers argued that those who showed the expected poor outcomes were likely to be less informative. Three key elements appeared to characterize resilience: (1) personal agency and a concern to overcome adversity; (2) a self-reflective style; and (3) a commitment to relationships.

The second example is provided by Laub and Sampson's (2003) following up to age 70 years of the Glueck's sample of 500 incarcerated adolescent delinquents and 500 matched nondelinquents. Quantitative data showed positive turning point effects leading to resilience associated with military service, marriage, and employment. The interview responses pointed to human agency exercising focused choice. Given all the horrors of war, one may well ask why, in a disadvantaged delinquent group, this proved protective? The two main explanations seemed to lie in the U.S. G.I Bill that provided college education for those serving in the army. This opened up crucial opportunities for a group who had often opted out of schooling. This went along with a postponement of marriage – a postponement that meant the widening of marital choice beyond the individuals' own delinquent peer group. Marriage proved even more protective (see Sampson, Laub, & Wimer, 2006). It might be supposed that this just derived from a loving relationship but the interviews showed that the protective elements also lay in social support and commitment, the informal social control provided by wives, the change in routines, lifestyle activities and peer group, a residential change, and the birth of children with their consequent effects on responsibilities and the need for regular paid employment.

Putting these multiple social context studies together, the pathways to resilience seemed to lie in the combination of a new opportunity that served to knife off a disadvantaged past, a sense of active agency to make the most of the opportunity, and a multiplier effect that served to strengthen and reinforce the change for the better. The personal protective qualities that seemed important included good scholastic achievement, a secure selective attachment, multiple harmonious relationships, a sense of self-efficacy, a range of social problem solving skills, a positive social interactional style, and a flexible, adaptive approach to new situations. Positive school influences fostered these qualities by, amongst other things, giving ample opportunities for both success and responsibility, as well as appropriate models of behavior. Community influences added the dimension of collective efficacy and community cohesiveness.

Gene-Environment Interactions (GxE)

In this chapter so far, attention has been mainly paid to social psychological features that appear to have an environmentally mediated effect serving to foster resilience. This must be balanced by the strong evidence that genetic influences have a strong role in moderating the effects of risk environments (probably through an impact on environmental susceptibility and not just on responses to adverse circumstances). For example, pioneering epidemiological/longitudinal studies by Caspi, Moffitt, and their colleagues using the Dunedin cohort have shown that a polymorphism of the serotonin transporter promoter gene moderated the effect of child maltreatment on the liability to depression (Caspi et al., 2003) and that a polymorphism of the MAOA gene does the same in relation to the liability to antisocial behavior (Caspi et al., 2002). Risch et al. (2009) have expressed doubts about these statistical interactions but their review was flawed (Uher & McGuffin, 2010) and there are many epidemiological replications, as well as biological support from both animal models and human experimental studies (Rutter, Thapar, & Pickles, 2009). The precise mechanisms are not known but the implication is that the environmental effects may be operating on the same biological pathway as the genetic effects. Uher (2008) has suggested that the findings may have useful therapeutic implications, but these have yet to be put to the test.

Finally, we should recognize that the very important findings on GxE do *not* mean that the genetic effects irrevocably *determine* outcome. The effects are probabilistic and this potential lies in the possibility of understanding both the genetic and environmental causal pathways, and not in any supposed fixed effect.

Some Caveats and Concerns

The focus in this chapter has been strictly on the phenomenon of resilience: namely, that, even with the most extreme adversities, some individuals nevertheless function well and a few appear strengthened by their negative experiences. As discussed, there is good evidence that the phenomenon is real and, clearly, it provides an important element of hope. On the other hand, it is crucial that we do not assume that abuse, neglect, and torture are a "given" that must be accepted. To the contrary, it is essential that all appropriate steps be taken to reduce their occurrence. That is at least as important as resilience but, because the policy and practice implications are different, it is outside the scope of this chapter. In addition, it would be misleading to assume that all individuals could become resilient. That is implausible. Moreover, although there is a wealth of promising intervention initiatives to foster resilience, very few have been subject to rigorous tests of their efficacy. We have yet to determine what works best for which individuals, what mechanisms mediate efficacy, and why some individuals fail to show a beneficial response. These issues remain a research challenge.

Some people working in the resilience field have urged that we "depathologize" post-traumatic stress disorders and other responses to severe stress and adversity. Presumably, this argument is based on recognition that it is "normal" to show such responses. In my view, that is a mistaken way of conceptualizing the issues. It involves a return to an outmoded mind-body dualism. There is good evidence that stress and adversity have measurable effects on brain and neuroendocrine structure and function (see Arnsten, 2009) and that some of these effects are maladaptive (and therefore "pathological"). We do not depathologize cancer and heart disease because environmental factors play a major role in etiology. Why, therefore, should we seek to do so with mental disorders? Perhaps, however, the plea is based on recognition that not all stress disorders require treatment. Quite so, but the same applies to grief and bereavement. Not all bereaved people need treatment but some do; hence the development of bereavement counseling. Professional responses should be shaped by need and not by invalid notions of pathology.

One other issue concerns the uncertainty regarding the mechanisms involved in the helpful effects of social support. Humans are social animals and, as such, social relationships are very important – as noted in some of the studies discussed in this chapter. Nevertheless, we should avoid the assumption that the security provided by a good loving relationship is all that matters. Self-efficacy is more important than high self-esteem (Bandura, 1997) – and also relationships may be important because they play a role in the development of goals, ambitions, and a sense of personal agency.

Biological Limitations on Resilience

There are optimistic messages in the resilience findings but it is important to appreciate that, not only do we have a limited understanding of how to foster resilience, but also there are limitations on resilience brought about by the enduring biological effects of some very seriously adverse environments (Rutter & Sonuga-Barke, 2010) and possibly some more ordinary environmental variations operating through epigenetic mechanisms (Meaney, 2010). Just because environments have biological effects does not mean that the effects are necessarily irreversible but there needs to be caution about the extent of resilience.

Conclusion

Resilience is a process and not a trait; moreover, it operates throughout the lifespan – before, during, and after adverse experiences. It involves a range of individual qualities that include active agency,

flexible responses to varying circumstances, an ability to take advantage of opportunities, a self-reflective style making it easier to learn from experiences, and a commitment to relationships. Family influences, both environmentally and genetically mediated, are important, but so are effects of the school and peer group, and community cohesion and efficacy.

References

Alexander, K. L., Entwistle, D. R., & Olson, L. S. (2001). Schools, achievement and inequality: A seasonal perspective. *Education Evaluation & Policy Analysis, 23*, 141–191.

Arnsten, A. F. T. (2009). Stress signalling pathways that impair prefrontal cortex structure and function. *Nature Reviews: Neuroscience, 10*, 410–417.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Bedard, K., & Dhuey, E. (2006). The persistence of early childhood maturity: International evidence of long-run age effects. *Quality Journal of Economic, 121*, 1437–1472.

Bourne, P. G., Coli, W. M., & Datel, W. E. (1968). Affect levels in 10 special forces 'A' team members under threat of attack. *Psychological Reports, 22*, 363–366.

Bourne, P. G., Rose, R. M., & Mason, J. W. (1967). 17-OHCS levels in combat: Data on 7 helicopter ambulance medics. *Archives of General Psychiatry, 17*, 104–110.

Bruhn, J. C., & Wolf, S. (1979). *The Roseto story*. Norman: University of Oklahoma Press.

Bruhn, J. C., & Wolf, S. (1993). *The power of clan: The influence of human relationships on heart disease*. New Brunswick: Transaction Publishers.

Caspi, A., McClay, J., Moffitt, T. E., Mill, J., Craig, I. W., Taylor, A., et al. (2002). Role of genotype in the cycle of violence in maltreated children. *Science, 297*, 851–854.

Caspi, A., & Shiner, R. L. (2008). Temperament and personality. In M. Rutter, D. Bishop, D. Pine, S. Scott, J. S. Stevension, E. Taylor, & A. Thapar (Eds.), *Rutter's child and adolescent psychiatry* (5th ed., pp. 182–194). Oxford: Wiley-Blackwell Publishing.

Caspi, A., Sugden, K., Moffitt, T. E., Taylor, A., Craig, I. W., Harrington, H., et al. (2003). Influence of life stress on depression: Moderation by polymorphism in the 5-HTT gene. *Science, 301*, 386–389.

Elder, G. H. (1974). *Children of the great depression*. Chicago: University of Chicago Press.

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100*, 363–406.

Gladwell, M. (2009). *Outliers: The story of success*. New York: Little, Brown, and Co.

Hauser, S., Allen, J., & Golden, E. (2006). *Out of the woods: Tales of resilient teens*. Cambridge: Harvard University Press.

Jahoda, M. (1959). *Current concepts of positive mental health*. New York: Basic Books.

Lareau, A. (2003). *Unequal childhoods: Class, race and family life*. Berkley: University of California Press.

Laub, J., & Sampson, R. (2003). *Shared beginnings, divergent lives: Delinquent boys to age 70*. Cambridge: Harvard University Press.

Layard, R. (2005). *Happiness: Lessons from a new science*. New York: Penguin Press.

Levine, S. (1956). A further study of infantile handling and adult avoidance learning. *Journal of Personality, 25*, 70–80.

Levine, S., Chevalier, J. A., & Korchin, S. J. (1956). The effects of early handling and shock on later avoidance behavior. *Journal of Personality, 24*, 475–493.

Masten, A. S., Hubbard, J. J., Gest, S. D., Tellegen, A., Garmezy, N., & Raimerz, M. (1999). Competence in the context of adversity: Pathways to resilience and maladaptation from childhood to late adolescence. *Development and Psychopathology, 11*, 143–169.

Meaney, M. J. (2010). Epigenetics and the biological definition of gene x environment interactions. *Child Development, 81*, 47–79.

Minton, H. L. (1988). *Lewis M. Terman: Pioneer in psychology testing*. New York: New York University Press.

Misch, J., & Grondin, S. (2001). Unequal competition as an implement to personal development: A review of the relative age effect in sport. *Developmental Review, 21*, 147–167.

Mohaupt, S. (2008). Review article: Resilience and social exclusion. *Social Policy and Society, 8*, 63–71.

Odgers, C. L., Moffitt, T. E., Tach, L., Sampson, R., Taylor, A., Matthews, C. L., et al. (2009). The protective effects of neighborhood collective efficacy on children growing up in deprivation: A developmental analysis. *Developmental Psychology, 42*, 942–947.

Quinton, D., & Rutter, M. (1988). *Parenting breakdown: The making and breaking of intergenerational links*. Farnham: Avebury.

Risch, N., Herrell, R., Lehner, T., Liang, K. Y., Eaves, L., Hoh, J., et al. (2009). Interaction between the serotonin transporter gene (5-HTTLPR), stressful life events, and risk of depression: A meta-analysis. *Journal of the American Medical Association, 301*, 2462–2471.

Rutter, M. (2006). Implications of resilience concepts for scientific understanding. *Annals of the New York Academy of Sciences, 1094*, 1–12.

Rutter, M., Maughan, B., Mortimore, P., Ouston, J., & Smith, A. (1979). *Fifteen thousand hours: Secondary schools and their effects on children*. Cambridge: Harvard University Press.

Rutter, M., & Sonuga-Barke, E. J. (Eds.), (2010). Deprivation-specific psychological patterns: Effects of institutional deprivation. *Society for Research in Child Development Monograph, 75*(1), 48–78.

Rutter, M., Thapar, A., & Pickles, A. (2009). From JAMA: Commentary on paper by Risch et al. (2009) – gene-environment interactions: Biologically valid pathway or artefact? *Archives of General Psychiatry, 66*(12), 1297–1289.

Sampson, R. J., Laub, J. H., & Wimer, C. (2006). Does marriage reduce crime? A counterfactual approach to within-individual causal effects. *Criminology, 44*, 465–508.

Sampson, R. J., Raudenbush, S. W., & Earls, F. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science, 277*, 918–924.

Seagoe, M. V. (1975). *Terman and the gifted*. Los Altos: William Kaufmann.

Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychology, 55*, 5–14.

Shurkin, J. N. (1992). *Terman's kids: The groundbreaking study of how the gifted grow up*. New York: Little, Brown & Co.

Stacey, M., Dearden, R., Pill, R., & Robinson, D. (1970). *Hospitals, children and their families: The report of a pilot study*. London: Routledge & Kegan Paul.

Uher, R. (2008). The implications of gene-environment interactions in depression: Will cause inform cure? *Molecular Psychiatry, 13*, 1070–1078.

Uher, R., & McGuffin, P. (2010). The moderation by the serotonin transporter gene of environmental adversity in the etiology of depression: 2009 update. *Molecular Psychiatry, 15*, 18–22.

Ursin, H., Badde, E., & Levins, S. (1978). *Psychobiology of stress: A study of coping men*. New York: Academic.