

Psychology of Some 21st Century Issues: Longevity, Genetic Engineering, Hardship

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Contribution to symposium, M.E. Koltko-Rivera (Chair), *21st-Century psychology—
Selected issues, methods, and areas of focus*, at the 113th Annual Convention of the American
Psychological Association, Washington, DC, USA, August 18-21, 2005.

Abstract

Although historically the discipline of psychology has tended to be reactive, the twenty-first century will present challenges to human life that psychologists would be wise to address proactively. This presentation describes three such challenges, and some research questions regarding them that could usefully be addressed by psychologists in many subdisciplines and specialties. The three challenges involve (1) increases in human longevity (whether we see an increase in infirm or vigorous older people), (2) human genetic engineering (including genetic medicine, human cloning, and human genetic enhancement), and (3) increased hardship (due to demographic reconfigurations, environmental crises, oil shortages, infectious diseases, and terrorism). The author calls for the formation of a future-oriented perspective across all subdisciplines and specialties.

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The discipline of psychology seems to be reactive; that is, psychologists first notice events, and then respond (with research, intervention, or both). We are now at a juncture where psychology should be proactive in grappling with emerging societal trends. By many indications, the degree of difference between the worlds of the twentieth and twenty-first centuries will be greater than that between any two preceding consecutive centuries in history, at least in developed countries. This is a strong claim to make, but it seems to be an accurate reading of responsible forecasts that have been made by physical, biological, and social scientists, as well as other futurists (e.g., Bindé, 2001; Brockman, 2002; Dertouzos, 1997; Kennedy, 1993). Given the magnitude of the changes to be faced by those now alive and their immediate descendants, it would be wise for psychologists everywhere to consider now how best to help people influence or adjust to this emerging world. A proactive psychology

might help society navigate its challenges; a reactive psychology will do little more than bear witness to those challenges.

I call for the formation, not of a new specialty, but of a new perspective within all subdisciplines and specialties within psychology: a future-oriented perspective, which seeks to consider the potential social and psychological consequences of future conditions, as well as the psychological conditions that lead to, encourage, or mitigate these consequences. The ultimate objective of a future-oriented perspective is to enable human societies to choose or nurture desirable potential consequences, and to reject or mitigate undesirable potential consequences. Wisely has it been said that the best way to predict the future is to create it.

Several trends, demographic and technological, are converging to create this different world. These include: (1) a potential increase in human longevity; (2) genomics and genetic engineering; and, (3) an increasingly harsh life environment. I will consider each of these areas, along with potential research questions for psychologists to consider as they address some of the issues of life in the twenty-first century.

Longevity

The twenty-first century may witness significant increases in both mean and maximum possible human lifespan. However, such increases would create challenging consequences, both for the individuals who partake of this increased lifespan, and for the societies in which they live.

There is a great difference between *mean* life expectancy (mean lifespan) and *maximum* life expectancy (maximum lifespan). The former is simply the arithmetic average of observed lifespans (e.g., of the cohort born during a particular year), while the latter is the longest lifespan that a human is capable of attaining. Over the last century, medical science actually has had only a modest effect on mean lifespan, and a very small effect, if any, on maximum lifespan (W. R. Clark, 1999/2002, pp. 14, 197-200, 204).

However, with the announcement in the year 2000 of the virtually complete mapping of the human genome (Shreeve, 2004), all this may change.

Currently, there is a strong focus in certain quarters on research to increase maximum possible human longevity by a quantum leap, through genetic manipulation (Alexander, 2003; Guarente, 2003; Hall, 2003; West, 2003). If this effort is successful,

increased human longevity would come with consequences. We may divide these consequences broadly into two scenarios, in which society sees an increase in either infirm or healthy older people, respectively. Surely these scenarios would have very different impacts on family relationships, life satisfaction, psychopathology and its treatment, work and career development, and other aspects of life and society. (It may well be that our future will see aspects of both of these scenarios, if the increased number of older people is split between the infirm and the vigorous old.) I shall consider some specific issues raised by each scenario.

The "Infirm Old" Scenario

All other things being equal, longer mean human lifespan would mean that a much larger proportion of the population would survive long enough to experience the diseases that are probabilistically associated with age. These include Alzheimer's disease, dementia, diabetes, hypertension, Parkinson's disease, stroke, and, for men, prostate cancer. Although statistically significant declines have been noted in chronic disability prevalence rates over the last two decades (Manton, Corder, & Stallard, 1997), the modest declines noted are likely to be overwhelmed by any significant increase in mean lifespan. In reference to these diseases, W. R. Clark (1999/2002) has noted:

As we . . . increasingly avail ourselves of the information and technologies to achieve longer and more productive lives, we must never forget that if we succeed there will be underlying costs, and that these are potentially heavy costs. . . . The incidence of chronic, debilitating idiopathic diseases such as Alzheimer's disease, stroke, Parkinson's disease, and many others increases almost exponentially past age eighty-five or so. The care of human beings with these disorders is enormously expensive. Most such individuals are completely unable to sustain themselves, either on a personal level or financially, in terms of monies they may have set aside to provide for their later years. (p. 210)

The larger social context adds an additional complication to this issue. Governmental programs intended to assist the elderly sick and infirm originally were designed for a small number of elderly people, supported by a large number of younger working people. However, the first half of the twenty-first century will see what some have called "the greatest demographic change in human history" (Kotlikoff & Burns, 2004, p. 1), in which a large number of elderly people will have to be supported by a small number of younger working people (see also W. R. Clark, 1999/2002, p. 211). Maintenance of governmental support may require a huge increase in wage taxes for workers, and a substantial increase in the retirement age.

Given these considerations, several psychological questions arise. There is something of the fable of “The Ant and the Grasshopper” (1980) to be seen in the contrast between those who prepare early for their medical and other needs in retirement, and those who do not. What are the correlates and potential predictors of being an ‘ant’ versus being a ‘grasshopper,’ in terms of oft-researched variables such as personality and education, as well as more-recently identified variables, such as personal worldview (Koltko-Rivera, 2004)? Using these correlates as mediating variables, but working within experimental research frameworks, what factors influence people in their early working years to begin to provide for their own care in their elderly years? (We might expect, for example, that people of different personalities or worldviews might be influenced by different styles of educational outreach.) Failing that, how will intergenerational relationships in a family change, as caring for “old old” parents, grandparents, and great-grandparents becomes an issue for a greater proportion of the population? How will economic and other social behavior change, as a greater proportion of working wages is taxed in order to support governmental medical programs for the aged? How will the world of work and career development change, if it becomes necessary to raise the average age of retirement to age seventy or seventy-five, as some believe must occur (e.g., W. R. Clark, 1999/2002, p. 212)?

In terms of psychological or psychosocial interventions, what can be done to prevent, treat, or adapt to the diseases that are associated with age? For example, forming detailed implementation plans facilitates adherence to health behaviors (Liu & Park, 2004). It has been found, with older adults suffering macular degeneration, that control beliefs contribute to differences in functional ability and positive affect (Wahl, Becker, Burmedi, & Schilling, 2004); one reasonable extension of this research would be to investigate whether helping older adults develop more internal control beliefs might enhance their ability and affect. Treatments exist for helping to stave off age-related cognitive decline (Elias, 2005). It may be worthwhile to apply the emerging therapy of neurofeedback to treat cognitive decline (Demos, 2005; Thompson & Thompson, 2003). There is some evidence that what we might call the thoughtful installation of hope can make a difference in recovery from some diseases (Groopman, 2004), and there is much that psychologists can do to investigate this issue rigorously. Beyond this, there likely would be great physical and mental health benefits to finding ways to nurture a permanent optimistic and positive attributional style (see Seligman & Csikszentmihalyi, 2000).

The “Vigorous Old” Scenario

Even if the aging-related diseases mentioned above were summarily cured through genetic engineering, this would not entirely mitigate the societal fiscal issues that I mentioned in relation to the “infirm old” scenario. It would simply shift the focus:

instead of governmental programs involved with health care being overwhelmed by great masses of sick older people, programs for income support would be overwhelmed by hordes of healthy ones. (Of course, as I mentioned earlier, *both* circumstances may occur.) Thus, some of the societal issues that I mentioned earlier—the changed nature of the social contract caused by changing taxation and retirement patterns, for example—would still apply under a “vigorous old” scenario, and would give rise to consequences for family and intergenerational relationships, and the domain of work and career.

Aside from the matter of disease, normal aging itself has a negative impact on a variety of cognitive functions. For example, there are normal aging-related deficits in perceptual and processing speed (Hoyer, Stawksi, Wasylshyn, & Verhaeghen, 2004; McCabe & Hartman, 2003), visual attentional multitasking (McCarley, Mounts, & Kramer, 2004), retrospective memory and some aspects of prospective memory (Henry, MacLeod, Phillips, & Crawford, 2004), storage capacity for verbal material (McCabe & Hartman, 2003), detection of contingency in causal learning (Mutter & Williams, 2004), and some category learning processes (Filoteo & Maddox, 2004). As longevity increases, without intervention, a much larger proportion of people will experience these declines in cognitive functioning.

In terms of psychological or psychosocial interventions, what can be done to prevent, treat, or adapt to these cognitive dysfunctions? For example, social support seems to contribute to better memory performance (Arbuckle, Gold, Andres, Schwartzman, & Chaikelson, 1992). Surely social support and other psychosocial factors can be investigated to address memory and other cognitive dysfunctions.

Regrettably, we have relatively little developmental theory to guide us as we ponder other consequences of increased healthy longevity. Research and theory on human development has primarily focused on development during the childhood years and adolescence, rather than on adults or the aged. As Heckhausen and Schulz have observed:

. . . the field of life-course development and aging is . . . data rich but theory poor. Most existing developmental theories embrace limited temporal and functioning domains. With the exception of personality theorists such as Erikson, Loevinger, Gould, and Levinson, psychologists have made few attempts to develop life-span theories of development . . . (Heckhausen & Schulz, 1995, p. 284, references omitted)

What kind of developmental issues arise in the “old old” (i.e., age 80 and beyond)? This research should explicitly include developmental changes in affect, motivation, personality, family and social relationships, work, and worldview.

An increase in healthy longevity raises the question, what to do with the additional time that one has? For those who have had careers outside the home, what happens in life when one lives “in retirement” for as long as earlier generations have lived at all? For those who have worked primarily in the home, what happens in life when one lives long enough to have great-great-grandchildren? Normal aging is already associated with complex changes in motivation and goals (Fung & Carstensen, 2004); much more needs to be known regarding how these changes will be affected by increased longevity for large numbers of healthy older people.

How does the perceived meaning of life develop or change over the course of a long life? How does this development affect behavior and experienced happiness? There are important relationships in late adulthood between religiousness and spirituality, on the one hand, and psychosocial functioning and well-being, on the other (Wink & Dillon, 2003); how may these findings be translated into interventions for developmental enhancement with the elderly?

From a psychosocial viewpoint, what can be done to facilitate the development of a satisfying life during advanced age? (I.e., as many others have put it, when we have added more years to life, how do we add more life to the years?) In addition to goals and spirituality, increased satisfaction may involve interventions regarding the development of fulfilling interpersonal relationships, and other factors relevant to life satisfaction. The factors related earlier are associated with well-being; however, it has been noted that we have only “rudimentary indicators of well-being But much better measures are needed” (Diener & Seligman, 2004, p. 25); hence, there is a great deal of opportunity here for psychometric research.

In many Western societies, the focus of society is on the needs of people during their childbearing and childrearing years, and on the period of youth and adolescence; older people, to a large extent, are given a tertiary focus, at most. With the change in the demographics of Western societies, such that older people will comprise a much larger proportion of the population than they have heretofore, how might this change the nature of society? How might societal goals and processes change as the population becomes older? Answering these questions may involve the projective analysis of societal changes in terms of family relationships, community function, the world of work, governmental processes, micro- and macro-economics (including marketing),

even international polity. We can begin to address these questions now, through the use of scenarios and simulations in applied social psychological research.

Genomics and Human Genetic Engineering

Although the basic structure of the mechanisms of genetic transmission were discovered in 1953 (Watson, 1968), a new era in genetic engineering opened with the announcement of the completion of the mapping of the human genome in 2000 (Shreeve, 2004). Aside from longevity research, which I mentioned earlier, the challenges and opportunities in this area may be grouped into three areas: genetic medicine, human cloning, and human genetic enhancement.

Genetic Medicine

It has been claimed that, within the next twenty years, genetic medicine will yield the following benefits: the development of new types of antibiotics effective against both bacteria and viruses; a cure for Type 1 diabetes; effective treatments for Parkinson's and Alzheimer's diseases; effective treatments for AIDS; effective treatments for various degenerative diseases; treatments to grow artificial but biological organs; and, possibly, effective prevention of cancer. (Carlson & Stimeling, 2002). Aside from treatment technologies, genetic medicine is already yielding a large number of assessment technologies, especially involving fetal diagnosis (Harmon, 2004, p. 19).

In the case of adults, advances in genetics will fundamentally change the nature of prospective diagnoses. Dr. Francis Collins (2000), director of the Human Genome Project within the National Institutes of Health, has predicted that, within less than a generation, physicians will be able to tell individual patients, on the basis of lifestyle and genomic information, whether or not these patients would develop certain diseases, with close to complete certainty. Whereas lifestyle information currently yields *probabilistic* prospective diagnoses (for example, relating present smoking and diet to the potential development of certain cancers), lifestyle information plus genomic information will yield *definitive* prospective diagnoses.

However, there are consequences to this new technology. These consequences may be considered under three headings: ethical dilemmas for parents, reactions of adult patients, and eugenic discrimination.

Ethical Dilemmas for Parents

Fetal diagnostic information comes with consequences.

Most couples say they are both profoundly grateful for the new information and hugely burdened by the choices it forces them to make. The availability of tests earlier in pregnancy mean[s] that if they opt for an abortion it can be safer and less public.

But first they must decide: What defect, if any, is reason enough to end a pregnancy that was very much wanted? Shortened limbs that could be partly treated with growth hormones? What about a life expectancy of only a few months? What about 30 years? Or a 20 percent chance of mental retardation?

Striving to be neutral, doctors and genetic counselors flood patients with scientific data, leaving them alone for the hard conversations about the ethics of abortion, and how having a child with a particular disease or disability would affect them and their families. There are few traditions to turn to, and rarely anyone around who has confronted a similar dilemma.

. . . even many of those who have no doubts about their decision to terminate [a pregnancy] say the grief is lasting. (Harmon, 2004, pp. 1, 19)

What are the psychological issues surrounding such heart-rending decisions? Can what we know about the psychology of judgment and decision making (e.g., Baron, 2000; Leighton & Sternberg, 2004) be used to help people in these situations? How do personality, intellectual, and worldview variables affect decision making in these situations, and to what extent can (and should) people compensate for the effect of these variables? What are the effects on marriage and family life of making these decisions? Insofar as these effects are negative, how can we mitigate these effects?

Reactions of Adult Patients

As Collins (2000) has noted, how people will react to genomic information is currently unknown. For example, although some preliminary research has been conducted in this area (e.g., Koltko-Rivera, Gromadzin, & Passmore, 2002), it is unclear how genomic information will affect the way that people make lifestyle change decisions. Will knowing that one definitely will develop disease x unless one changes lifestyle y lead to change (“I really have to do something now”), or to fatalism (“I guess it’s just going to happen”)? As is so often the case in psychology, the best way to put the question may be, *under what circumstances* (e.g., personality trait configuration, medical provider interaction, medical consumer education, family support, education, personal worldview) will genomic information lead to change or to fatalism? (The “under what circumstances” qualifier should be understood to apply to the questions I raise throughout this presentation.)

Eugenic Discrimination

Genetic testing may also support a new kind of eugenic discrimination. Some see this as already developing.

Activists for the rights of the disabled say that a kind of grass-roots eugenics is evolving that will ultimately lead to greater intolerance of disabilities and less money for cures or treatments. And even some doctors who perform abortions are uncomfortable as some patients choose to quietly abort fetuses with relatively minor defects. . . .

The wider range and earlier timing of prenatal tests are raising concern among some bioethicists and advocates for disability rights who argue that the medical establishment is sending a message to patients that the goal is to guard against the birth of children with disabilities. . . .

Some doctors, too, say they are troubled by what sometimes seems like a slippery slope from prenatal science to eugenics. The problem, though, is where to draw the line. . . .

In an extreme case, [one ob-gyn in New York] performed an abortion for a woman who had three girls and wanted a boy. (Harmon, 2004, p. 19)

The history of eugenics movements in the United States and elsewhere is painfully instructive (Black, 2003; Goliszek, 2003). For some societies, it has been a small step from detection of certain disabilities to insisting that those with these disabilities be marginalized or even exterminated from the society. One already sees in the professional literature support for a precursor step, the selection of embryos on the basis of intelligence (e.g., Savulescu, 2001). However all social processes are open to influence.

What are the social and psychological circumstances that promote discrimination against those identified as having certain genetic characteristics? What can be done by disciplinary psychology to undercut this discrimination? There is, of course, a mass of research available on the psychology of prejudice and discrimination (summarized in Plous, 2003). This research forms a platform on which to build future-oriented research.

Human Cloning

Despite legal constraints that currently ban the cloning of human beings in the United States, there is active research in this general area (Alexander, 2003); scientists in the United States and abroad have made reliable reports of progress in the technologies required to conduct human cloning (Rohm, 2004). It is thus likely that, in the near future, we will receive reports of successful human cloning.

There have been extensive debates of the ethics of cloning (e.g., Graham, 2002; McGee, 2002; President's Council on Bioethics, 2002), and some consideration of its religious implications ("And Man Created," 2004). Some preliminary research has investigated correlates of attitudes towards cloning (e.g., May & Koltko-Rivera, 2003); this area deserves much further investigation. However, there has been little or no consideration of the potential psychological and social impact of cloning. Several questions come to mind about this issue.

What impact may the possibility of cloning have on an individual's life choices? Life has always been considered a "one to a customer" proposition (*pace* reincarnationists). Responsible adults always have had to conduct their lives in the knowledge that many of their choices would have life-long consequences; "do-overs," in many situations, simply are not possible. Might cloning change that? Would the possibility that one could clone oneself change the stakes of living, at least for those who have the financial resources to afford the procedure?

What psychological effect might cloning have on the clone? Does it make a difference to one's sense of self to know that one is a genetically identical copy of someone else, especially if one was created at that person's behest? If this does engender such a difference, how does this difference manifest in behavior? Here again, simulation and scenario are relevant research techniques.

Especially in light of the projected drop in the number of working age people that is predicted for the twenty-first century (Kotlikoff & Burns, 2004; Longman, 2004), it will surely occur to someone that one solution to the projected worker shortage would be the production of new workers through cloning. If this were pursued, what social structures might emerge? As Zimbardo's (1972) prison experiment and Milgram's (1974) obedience to authority experiments have demonstrated, structural differences in power can have extremely negative effects on the way that "normal" people treat disempowered groups. This, along with the previously cited research on prejudice and discrimination, would suggest that cloned workers might quickly become stigmatized, mistreated, and abused, but this is purely speculative; anticipatory simulations of this situation might provide data relevant to this point.

Will the availability of cloning make existing people seem more disposable? For that matter, will the availability of made-to-order genetically engineered individuals change patterns of human reproduction and family formation?

Human Genetic Enhancement

The age-old effort to improve upon nature is now taking the form of human genetic enhancement (Alexander, 2003; Mehlman, 2003). Technology is now being developed that would give humanity the opportunity to redesign itself (Elliott, 2003). This technology is already being applied; for example, some have concluded that wide-scale 'gene doping' (i.e., the genetic enhancement of an athlete's musculature) is imminent (Sweeney, 2004). As one might expect, these developments have raised some ethical controversy (Fukuyama, 2002/2003; Graham, 2002; Habermas, 2003; President's Council on Bioethics, 2003; Rothman & Rothman, 2003; Stock, 2002/2003). Regrettably, there has not been much research into the potential psychological and social dimensions of human genetic enhancement.

What are the correlates of different attitudes on genetic enhancement? What might be the effects of different types of genetic enhancement on self-image, self-esteem, moral development, group identification? How might these effects be mediated by preexisting circumstances (e.g., personality, prior social functioning, worldview)?

Given that technological advances typically do not spread throughout society at an even pace, what might be the social psychological effects of a new dimension of societal division, in which there are genetic enhancement "haves" and "have nots"? Experience with racial segregation in the United States demonstrated long ago the negative effects of societal divisions (K. B. Clark, Chein, & Cook, 1952/2004). This situation calls for anticipatory research.

Hardship and Disaster

There are several indications that we are entering a period that will witness a marked increase in hardship and suffering:

Demographic reconfigurations. As mentioned, increasing longevity, in conjunction with lower birth rates, means that there will be far fewer people to support the aged. The interaction of demographics and the finances of retirement systems may create "the fiscal equivalent of a perfect storm" (Peterson, 2004, p. 122). Although society can take steps now to prepare for this situation, the political realities of these issues are such that these steps may well not be taken, resulting in various problems—such as heavy taxation of the young for the sake of the old (Kotlikoff & Burns, 2004).

Environmental crises. Widespread ecological/environmental disaster has been predicted by competent scientific authorities (e.g., Rees, 2003; Wilson, 2002/2003).

Global warming is already occurring (Gelbspan, 1998; Pearce, 2002), a situation that may fuel an increase in severe, even catastrophic weather (Maslin, 2002). There are some steps that individuals and nations can take to address the environmental crisis (e.g., Brown, 2003; Langholz & Turner, 2003; Starke, 2004), but an insufficient number of people and nations have shown a willingness to take these steps thus far.

Oil shortages. Public pronouncements of oil companies and energy firms give one the impression that we have adequate reserves of oil for future projected needs, but such pronouncements are rhetorical sleight of hand. The only publicly available data, the data of actual oil production figures, is far less optimistic. "In the long run, actual production is the most important proof that reserves exist" (Berenson, 2004, p. B3), and production at two major oil producers, Chevron Texaco and BP, fell by over 15% over the period 1998-2003 (Berenson, 2004). As an oil analyst at a major investment firm put it, "the maturing geological base is starting to rear its ugly head" (Pfeifer, quoted in Berenson, 2004, p. B3). The industrialized world is simply running out of oil (Appenzeller, 2004; Goodstein, 2004; Roberts, 2004). The consequences on the lifestyle of the energy-hungry industrialized nations will be far-reaching and long-lasting.

Infectious diseases. Human societies worldwide are threatened by a rise in infectious diseases that are resistant to treatment (Garrett, 1994; Levy & Fischetti, 2003; Zimmerman & Zimmerman, 2003). To some extent, this is because widespread abuse of antibiotics has promoted the natural development of antibiotic-resistant strains of disease. Beyond this, we are witnessing the emergence of naturally mutating strains of disease-causing organisms, whose effect is exacerbated by their emergence in a context of widespread human access to transcontinental transportation.

Terrorism. There is every reason to believe that global terrorism will be a long-term aspect of life. Terrorism is a complex phenomenon with a long history (Ellens, 2004; Moghaddam & Marsella, 2004; Stout, 2002). Modern technology has made it possible for a relatively small number of terrorists to have an enormous impact on vast numbers of people (Schweitzer, 2002). Because the root causes of terrorism are not necessarily addressed by military responses (Plous & Zimbardo, 2004), terrorism itself is likely to continue to be a part of twenty-first century life, despite the massive military means that have been devoted to containing or eliminating terrorism.

Each of these issues raises questions for disciplinary psychology. These questions may broadly be grouped under the headings of description, prevention/mitigation, and the management of consequences.

Description

Under this heading we consider two types of research involving socio-psychological variables associated with these crises. One type of research involves correlates of these crises; the other involves the effects of these crises.

Each of these crises has at least some aspect of its cause in human behavior. The number of available young workers is, at least in part, the result of human choices. Human impact on the natural environment, and the energy crisis, result from many personal and group choices. Terrorism is, of course, a human behavior, which in turn is promoted or inhibited by other human behaviors. Even the increase in infectious disease is driven, in part, by human overconsumption of antibiotics. For each of these sets of circumstances, there are doubtless social and psychological correlates that will shed light on the development of these circumstances. For example, what set of demographic and psychological variables correlate with behaviors that inhibit versus exacerbate the environmental crisis? Although it has been pointed out that there is no “terrorist personality” as such (Plous & Zimbardo, 2004), surely there are some sort of differences between those of similar cultural and socioeconomic background who chose either to engage in or to abstain from terrorist activity.

We may also benefit by attempting to anticipate the effects of these crises. For example, how will younger generations react if they are taxed very heavily to support the aged? What is the effect of chronic exposure to terrorist threat? For that matter, who prepares for hardship, and who allows themselves to be victimized by it?

Prevention/Mitigation

Under this heading we consider means by which to prevent or mitigate each of these crises. For example, it has been asserted that both the cause and the cure for many environmental problems lies in human psychology (Nickerson, 2003; Walsh, 1984; Winter & Koger, 2004); surely this suggests the need for research oriented at testing this proposition, and suggesting programs for mitigating the environmental crisis.

Management of Consequences

In this sector of concern, our focus is on helping people to cope with the effects of each of these disasters. For example, how can we encourage wide-scale hardiness, resilience, and optimism among the populace, to better cope with each of the disasters mentioned?

Conclusion

Space limitations forbid me from dealing with a number of other interesting potential developments (e.g., the increased prevalence of interactive virtual environments, Koltko-Rivera, 2005; the development of powerful artificial intelligence; the discovery of extraterrestrial life). However, the important thing is the future-oriented perspective itself. The development of such a perspective will result, no doubt, in the consideration of many interesting topics that I have not foreseen here. The inclusion within psychology of a proactive, future-oriented perspective will give psychology the opportunity to be maximally useful to human society.

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