

HEALTH AND THE ECOLOGY OF ALTRUISM

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Biological communities are diverse in part because there are many ways to survive and reproduce. Any given species thrives in some environments and becomes stressed in others, ultimately to the point of failing to persist.

Human behavioral diversity can potentially be explained in the same way as biological diversity. A particular behavioral strategy such as risk avoidance, conscientiousness, or cooperation is advantageous in some situations but not others. Individuals who employ the wrong strategy in a given situation become stressed, ultimately to the point of changing their behavior, removing themselves from the situation, or suffering the physical and psychological consequences of maladaptive behavior. Because there is no single best strategy for all situations, a mix of strategies will be maintained in the population through a number of proximate mechanisms, including short-term individual flexibility (e.g., becoming cautious in dangerous situations), developmental processes (e.g., becoming temperamentally cautious as a result of childhood experiences), and long-term evolutionary processes (e.g., being innately cautious).

This ecological perspective has important implications for the study of altruism and health. Other-regarding behavioral strategies have coexisted with more self-regarding strategies throughout human history. Clearly, both must be advantageous in some situations and disadvantageous in others to be maintained over such long periods of time. Altruism should have beneficial health consequences primarily when it thrives as a behavioral strategy. Otherwise it should become stressful, which is why it is abandoned. The same goes for self-regarding behaviors.

These predictions seem inevitable because they apply to any behavioral strategy that thrives in some “niches” but not others. However, the situation is more complicated for altruism and selfishness than for other behavioral strategies because selfishness is often morally objectionable and the “niche” for altruism is often of our own making. We don’t council people to be selfish—for their health or any other reason—because that would impair the health and wellbeing of others. We do council people to be altruistic because altruism thrives in the company of other altruists. By encouraging altruism and

discouraging selfishness, we create the niche for altruism (Sober and Wilson 1998, Wilson 2002).

Given the complications that are specific to altruism and selfishness, along with the basic predictions that apply to any behavioral strategy, it is essential to appreciate the importance of context in the study of altruism and health. Altruism can be highly gratifying (and therefore healthful) *in some situations*, especially when it involves working with others who reciprocate or express gratitude. Altruism practiced in face-to-face interactions might be especially healthful because the psychological mechanisms that make altruism personally rewarding evolved in the context of face-to-face interactions. On the other hand, altruism can be stressful *in other situations*, especially when it is unreciprocated, unappreciated, or fails to trigger appropriate proximate mechanisms. Selfish behavioral strategies might be unhealthy *in some situations*, especially when they result in social isolation in the long run despite their short-term benefits, but *in other situations* they might yield health benefits in addition to other benefits, much as we might wish otherwise. Finally, we might expect individual differences based on past experiences and (conceivably) genetic factors. People who are currently practicing different behavioral strategies will not necessarily experience the same health consequences of altruism in a given situation.

TESTING ECOLOGICAL PREDICTIONS

Testing ecologically informed predictions such as these requires a database that provides information about behavioral differences and their consequences in everyday life. One such database is the Sloan study of youth and social development, conducted by a team of scientists headed by psychologist Mihaly Csikszentmihalyi and sociologist Barbara Schneider to examine how adolescents make the transition from school to the work force (Csikszentmihalyi and Schneider 2000). Twelve geographical locations in the United States were chosen to represent rural, urban, and suburban environments, different racial and ethnic compositions, labor force characteristics, and economic stability. Within each geographical location, a number of middle schools and high schools participated, resulting in 33 schools for the entire study. Over 1000 students were followed for a

period of five years. Information gathered at bi-yearly intervals included a battery of questionnaires totaling over 400 items and a week of the experience sampling method (ESM), which involves being signaled eight times a day and recording basic information about external circumstances (Where you are, what you are doing, and who you are with) along with 33 variables measuring psychological experience (e.g., anger, happiness, cooperation, concentration) on numerical scales. In addition to these “focal” students, a subset of information was gathered on over 3,000 classmates of the focal students (termed “cohort” students).

The information gathered by the Sloan study can be used for many purposes in addition to its original focus. In collaboration with Csikszentmihalyi and Schneider, I used 17 questionnaire items to construct a scale that measures individual differences in prosociality (a term that includes all forms of other-oriented behavior). Items on the PRO scale include questions such as “For the job you expect to have in the future, how important is helping people?” and “How often do you spend time volunteering or performing community service outside of school?” that clearly relate to other-oriented attitudes and behavior. Construction and validation of the PRO scale will be reported in more detail elsewhere. In this article I use the scale to show that prosociality can be either good or bad for one’s health, depending upon the context.

Altruism’s niche

A broad look at the ecology of altruism is provided by the multiple regression analysis shown in table 1. Fourteen items from the database account for almost 40% of the variance in the PRO scale. The items fall into the following categories:

Gender: Females on average score higher than males, independently of the other variables.

Social support: The items “How many teachers care”, “Neighbors will help”, and “Family avoids hurting feelings” suggest that prosocial *individuals* tend to inhabit prosocial *environments*, receiving benefits in addition to bestowing them.

Personal efficacy: The items “Feels hopeful about the future”, “Energetically pursues goals”, and “Feels like a person of worth” suggest that highly prosocial individuals are also highly efficacious *as* individuals.

Long-term goals: The items “Time spent on homework out of school”, “Importance of having children”, “Importance of giving own children opportunities”, “Expects to encounter obstacles” and “The importance of partying among friends (negative correlation)” suggest that highly prosocial individuals are more likely to work toward long-term goals. They have a long *temporal* horizon in addition to a wide *social* horizon.

Religious participation: The items “Religion affects decisions” and “Importance of religion among friends” indicates the role of religion in promoting prosociality, independently of the other factors.

Taken together, these items suggest that highly prosocial individuals tend to inhabit stable nurturing environments that enable them to thrive as individuals and work toward long-term goals. Broadly speaking, this can be said to be the “niche” for altruism. Needless to say, it is a picture of health at both the individual and societal levels. It is also exactly what we would expect from a theoretical perspective, since altruism and other forms of prosociality can only persist over the long term if those who produce benefits for others also receive them.

As we leave the niche for altruism and enter less stable and nurturing environments, individuals become less prosocial on average. This could be caused by a variety of proximate mechanisms. Perhaps individuals are flexible enough to change their prosociality in response to environmental change. Perhaps they are not so flexible but their stable dispositions cause them to sort into different environments. Either way, a high-PRO individual inhabiting a low-PRO environment is like a fish out of water and should find the experience *stressful*.

When bad things happen to good people

Participants of the Sloan study were asked whether a number of important and potentially stressful events had occurred during the previous two years, ranging from moving to a new home to being assaulted. During year 5 they were also asked how stressed they were by the events. Some of the events were rare but the sample sizes were so large that out of 1779 participants who responded to the question “Were you shot at?”, for example, 165 answered “yes”. Table 2 shows a very consistent pattern: Low-PRO individuals are more likely to experience events characteristic of harsh social environments such as physical conflict and teenage pregnancy (negative coefficient values in the “Likelihood of occurrence” section of Table 2). When these events are experienced, however, the degree of stress correlates *positively* with prosociality (positive coefficient values in the “Stress upon occurrence” section of Table 2). Low-PROs are apparently better able to cope with these events, either because they are more familiar or because they are less upsetting whenever they occur. Either way, these results provide a convincing demonstration of the “fish out of water” phenomenon. Altruism is not a successful behavioral strategy in all environments and should not be expected to have beneficial health consequences such as stress reduction in all environments. People who freely give should be highly stressed in situations that involve aggressive or manipulative taking, for the same reason that they protectively change their behavior, attempt to change the situation, or attempt to leave the situation.

When good things happen to bad people

On average, low-PRO individuals suffer from low self-esteem, are pessimistic about the future, and believe that luck is more important than hard work. They score significantly higher on the items “I usually feel stressed”, “I usually feel sick”, and “I usually feel tired” (ANOVA’s, $N=1653, 1648, 1651$; $df=4$; $F=2.9, 4.69, 4.92$; $p=.020, .0009, .0006$ respectively). Nevertheless, this unhealthy portrait based on averages obscures differences that exist among low-PRO individuals. In particular, it does not fit the image of the narcissist who cares only about himself and treats others as a means to

personal ends. Such a person might easily have high self-esteem, be optimistic about his own future, and exult in his ability to manipulate people without leaving anything to luck. This is the standard image of a selfish person in popular culture, “cheating” strategies in models of social behavior (Sober and Wilson 1998, Hammerstein 2003, Gintis et al. 2005), and the psychological literature on Machiavellianism (Wilson et al. 1996), and psychopathy (Mealey 1995). Why isn’t this kind of low-PRO individual more conspicuous in our data?

The answer is that this kind of low-PROs *does* exist in our sample population but is obscured in the multiple regression analysis by other individuals whose lack of prosociality appears due to various forms of stress. To distinguish these two profiles, we performed a cluster analysis on the lower 30% of the PRO-score distribution using nine items that we predicted would discriminate the two types of low-PRO individuals (indicated by the asterisks in the second column of Table 3). Two distinct clusters emerged, as shown the top graph of Figure 1, which were used as groups in an analysis of variance for other items from the database. Significant differences were found for the variables shown in table 3, which have been normalized to a 0-1 scale and reversed as necessary so that higher values indicate agreement with the item. Mean values are provided for the entire sample population in addition to the two types of low-PRO individuals for comparative purposes.

To interpret table 3, we can begin by noting that almost 80% of the narcissistic low-PROs (designated “low-PRO-A”) are male, in contrast to an even sex ratio for the other low-PROs (designated “low-PRO-B”) and the general sample. Proceeding to the religious items, the A group scores higher than the B group but both are below the general sample average. For the remaining items, the most important pattern to note is that *the two low-PRO groups usually straddle the population mean*. For items likely to contribute to health, such as self-esteem and control, the A group not only scores higher than the B group, but also higher than the general sample average. Similarly, for items likely to detract from health, such as emotional emptiness, stress, and fatigue, the A group not only scores below the B group but below the general sample average. In short, *low-PRO-A individuals appear to be a picture of mental health, more like high-PRO*

individuals than low-PRO-B individuals. They are not maladaptive as individuals, although their behaviors may well be maladaptive to others.

Different ways to be good

Individual differences are also likely to exist among high-PROs, with potential health consequences. In particular, religion is an important correlate of prosociality in the general sample but not all high-PROs are religious. To examine differences between religious and non-religious high-PROs, a cluster analysis was performed on the upper 30% of the PRO-score distribution using six religious items indicated by asterisks in Table 4. Two distinct clusters were identified (bottom graph of Figure 1), which served as groups in an analysis of variance for other items, as with our analysis of low-PROs. Significant differences were found for the items listed in Table 4. Differences for the religious variables are expected because they served as the basis for discrimination in the cluster analysis. More interesting is the fact that non-religious high-PROs (labeled high-PRO-A) are *highly* nonreligious, scoring not only below the religious high-PROs but considerably below the mean for the general sample. Proceeding to the other variables, religious high-PROs (labeled high-PRO-B) reported higher self esteem, self-confidence, and faith in the future than non-religious high-PROs. They were subject to more parental control but resented it less. Finally, they were more likely to be known by their neighbors than non-religious high-PROs. In short, religious high-PROs present a more robust picture of mental health than non-religious high-PROs, who even score worse than average for the general sample on some items. Altruism can be stress-relieving or stress-inducing, depending upon how it is conceived and carried out.

Altruism, health, and immediate experience

So far, our analysis has been based on questionnaire items that were answered on a one-time basis, but the most important part of the Sloan study database is the experience sampling method, which involves recording thoughts and feelings as they are being experienced at roughly two-hour intervals for a week. Table 5 shows that

individual differences measured by the PRO scale were amply reflected in everyday experience. On average, High-PROs were able to concentrate, felt that they were living up to the expectations of others, and enjoyed themselves more than low-PROs. They felt more happy, active, sociable, involved, and excited. They felt more challenged and engaged by their activities, which were perceived as more important with respect to future goals. As with the regression analysis presented in Table 1 on the basis of one-time questionnaire items, this is a picture of health at both the societal and individual levels.

The last two columns of Table 5 compare the different types of low-PROs and high-PROs that were analyzed in Tables 3 and 4 respectively. Apart from the single item “Did you feel good about yourself?”, the differences between A and B low-PROs do not appear to be strongly reflected in daily experience. However, numerous differences exist between the high-PRO groups, indicating substantial emotional benefits for religious prosociality (B) compared to non-religious prosociality (A) at a day-to-day level.

THE ECOLOGICAL PARADIGM

This article makes three contributions to the study of altruism and health. First, we provide evidence that other-oriented individuals tend to flourish *as* individuals. Science works best when it uses a combination of methods, from naturalistic observations to controlled experiments. The Sloan study and especially its use of the experience sampling method provides a superb source of naturalistic information, acting as an invisible observer perched on the shoulders of people as they go about their daily round of life. It is gratifying that the benefits of altruism can be demonstrated at such an intimate and noninvasive level for a representative sample of American youth.

Second, we provide evidence that other-oriented individuals do not *invariably* flourish as individuals. It can be unhealthy to be altruistic and healthy to be selfish. Some forms of altruism appear to be healthier than others. Studying the health consequences of altruism requires a sophisticated understanding of *context*.

Third, we provide a theoretical framework for predicting *when* altruism flourishes or fails to flourish. The framework was briefly presented at the beginning of the article and will be elaborated below to provide a guide for future research.

Avoiding normative bias

Altruism is good for others and society, almost by definition (its virtue is occasionally challenged by thinkers such as Rand 1961). People have a passion for promoting altruism, in others if not always themselves. One way to do this is by calling altruism “natural”, “healthy”, and “mature” while branding selfishness as “unnatural”, “sick”, and “immature”. These labels might help to promote altruism but they are questionable as statements of fact. How can selfishness be called “unnatural” when it is displayed by other species and has existed throughout human history? In what sense are people who profit from exploiting others “sick” in terms of their individual health? How can such people—who might be 80 years old—be called immature, as if they are more like children than adults? It might seem that sophisticated thinkers would not commit these errors but intellectual history proves otherwise, from Rousseau’s noble savage, to Kohlberg’s stages of moral development (Kohlberg 1984, Krebs 1998), to fear and trembling that evolutionary theory might show something considered immoral to be “natural” and therefore somehow acceptable. Given such a widespread tendency for normative goals to influence interpretations of reality, it is important for the modern scientific study of altruism and health to distinguish itself from the kind of moral encouragement so common in everyday life, which takes the form of the factual claim “if you behave altruistically, then you will also be happier, healthier and wealthier.” Scientists who study altruism might well have the practical goal of making the world a better place (we certainly do), but as scientists they have an additional burden of telling a story about altruism that is factually correct.

It’s a Darwinian world

One purely scientific approach to the study of altruism is to imagine a world inhabited by beings who employ any feasible behavioral strategy, from pristine altruism to wanton selfishness. The individuals compete and some emerge victorious in terms of raw survival and reproduction. If the strategies are inherited in some sense (more on that

below) then the winners will inherit the earth and the losers will pass out of existence. We call this approach “purely scientific” because it does not have any normative commitment. The victorious strategies could be altruistic, selfish, or a mixture of both. We simply endow the world with certain properties, add the individuals with their behavioral strategies, and let the chips fall where they may.

It might seem that altruists are certain to lose such a Darwinian contest. One reason that Darwin’s theory provokes such an allergic reaction is because it seems so good at explaining selfishness and so bad at explaining altruism. However, Darwin had a key insight that has been confirmed by modern evolutionary theory. Altruists are indeed vulnerable to non-altruists in their immediate vicinity, but groups of altruists robustly out-compete groups of non-altruists. Whenever altruists can interact primarily with each other, they can thrive even in a strictly Darwinian world.

The behavioral strategies that emerge from evolutionary models of social behavior (which formalize the thought experiment of the previous paragraph) bear an uncanny resemblance to human social behaviors, including altruism, selfishness, retaliation, forgiveness, contrition, punishment, revenge, and arbitrary social conventions (norms). The particular strategies that emerge victorious depend upon the parameters of the model, which define properties of the particular “world” that is being imagined. The real world is a mosaic of the parameters that make up the model worlds, so each behavioral strategy is expected to have a distribution and abundance, much like species in a multispecies community. The fact that altruism and other forms of prosociality can flourish at least some of the time in a Darwinian world provides a theoretical framework for studying their distribution, abundance, and health consequences, as we have tried to show in this article.

Material and psychological benefits of altruism

The benefits of altruism can be divided into those with an obvious material basis (such as food, shelter, and medicine) and those with a more subtle psychological basis (such as comfort, respect, and forgiveness). A woman who helps disaster victims is

obviously increasing *their* health; the striking result is that she might also be increasing *her* health.

Evolutionary theory can help to clarify the relationship between these two kinds of health benefits. All adaptations have both an ultimate (their effect on survival and reproduction) and proximate (the particular mechanism that causes them to be expressed) explanation. Flowers bloom in spring because those that bloomed earlier were nipped by frost and those that bloomed later failed to mature their fruits (the ultimate explanation). Flowers also bloom in spring because of a physiological mechanism that is sensitive to day length (the proximate explanation).

In addition to orchestrating the behaviors that obviously influence fitness, proximate mechanisms can have fitness consequences of their own. *In general, the mechanistic and behavioral consequences are expected to parallel each other.* Zebras are not stressed in the absence of lions. When a lion suddenly appears, zebras are briefly stressed in a way that clearly enhances their survival behaviorally without suffering unduly from the stress response per se. If zebras were placed in a cage next to a lion, they would suffer from chronic stress that would become debilitating in its own right (Sapolsky 1998). Most people are unstressed in the company of friends, become stressed in isolation in a way that causes them to remedy the situation without suffering from their stress response per se, but can suffer health-damaging stress in permanent isolation. In both of these examples, the proximate mechanisms are most healthful in their own right when they successfully enhance survival and reproduction behaviorally, as they were designed to do.

It follows that the psychological benefits of altruism can be maximized by providing the kind of social environment that enables altruism to flourish in behavioral terms. It should also be important to provide the cues that reliably indicate such environments, especially in the context of small face-to-face groups. To be known, liked, respected, needed, and in the company of others are powerful psychological motivators because they consistently led to prosocial groupings in our evolutionary past. As proximate mechanisms, they are satisfying (and healthful) in their own right even when they don't lead to material benefits.

But aren't humans different?

Humans are profoundly different from other animals in their use of language, their cognitive abilities, and their capacity for culture. These differences are often used to argue that evolutionary theory has little to say about humans, however relevant to the rest of life. Ironically, our unique attributes might enable us to play the evolutionary game *better* than other species, especially when it comes to sophisticated behavioral strategies, altruistic or otherwise (Hammerstein 2003, Richerson and Boyd 2004, Gintis et al 2005). The concept of inheritance in the Darwinian contest needs to be interpreted broadly. Any process that causes the most successful strategies to increase in frequency counts as an inheritance mechanism, including learning and imitation in addition to genetic inheritance. Nongenetic inheritance mechanisms enable humans to adapt rapidly to their environments, vastly accelerating the pace of evolution. Moreover, humans are like beavers in their ability to change their environments, especially when it comes to the parameters relevant to altruism. We have derived ways to create prosocial groups and to solve the problem of exploitation within groups that are completely beyond the abilities of other species. These unique human attributes are better explained in terms of evolutionary theory than as a mysterious exception to the theory. Human uniqueness cannot be used to argue against the relevance of the evolutionary perspective.

Expanding altruism's niche

Earlier we stressed the need to distinguish the scientific study of altruism and health from the kind of moral encouragement, so common in everyday life, that altruism is good for the altruist. As an unconditional statement, this one is clearly false from an ecological and evolutionary perspective. However, it can be true as a conditional statement. *Given the right conditions*, altruism can be very good for the altruist, as our results show. Once we think of altruism as a like a species with a distribution and abundance, we can attempt to modify the environment to expand altruism's "niche".

This is not a new enterprise and religions appear to be especially effective at creating environmental conditions favorable for altruism, at least among their own members. Scientists interested in altruism have much to learn from religion (see also Wilson 2002, 2005). It will be interesting to see if the scientific study of altruism from an ecological perspective can expand altruism's niche still further.

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Item#	Item	Coeff.	s.e.	t-ratio	prob
1	Gender	4.49	0.59	7.56	****
2	How many teachers care	1.61	0.30	5.39	****
3	Neighbors will help	0.85	0.32	2.67	**
4	Family avoids hurting feelings	1.52	0.60	2.54	**
5	Feels hopeful about future	2.01	0.34	6.00	****
6	Energetically pursues goals	2.59	0.52	5.03	****
7	Feels like a person of worth	1.34	0.45	2.98	**
8	Time on homework out of school	0.73	0.15	4.74	****
9	Importance of having children	1.91	0.44	4.39	****
10	Importance of giving own kids opportunities	2.29	0.56	4.08	****
11	Expects to encounter obstacles	1.62	0.45	3.58	***
12	Importance of partying among friends	-1.37	0.39	-3.48	***
13	Religion affects decisions	1.25	0.24	5.16	****
14	Importance of religion among friends	2.05	0.47	4.38	****

Table 1. Items retained in a stepwise multiple regression analysis, explaining 39.3% of the variance in the PRO scale. Number of asterisks designate <.05, <.01, <.001, and <.0001 significance values.

Did this event happen in last 2 years?	Likelihood of occurrence			Stress upon occurrence		
	Coeff.	R2	p	Coeff.	R2	p
Moved to new home	-1.55	0.10	*			
Parent got married						
Parents got divorced						
Mother lost job						
Father lost job						
Mother started work						
Father started work						
Family member sent to jail						
Had baby	-5.13	0.60	****	2.33	3.40	*
Became seriously ill						
Father died						
Mother died	-4.63	0.20	**			
Close relative died				1.72	2.20	****
Family member ill	2.25	0.40	**			
Family went into counseling						
Family member victim of crime				1.93	3.00	***
Had something stolen				0.91	0.90	*
Someone offered to sell drugs	-3.49	1.50	****			
Someone threatened to hurt	-2.83	0.70	****			
Got into a physical fight	-5.86	2.00	****			
Hit or beaten up	-3.00	0.70	***	1.35	2.10	**
Shot at	-6.11	0.02	****	2.02	0.04	**
Witnessed a violent crime	-3.60	1.20	****	2.23	5.30	****
Self or someone known assaulted	-1.42	0.20	*	2.02	4.70	****

Table 2. Single factor regression analyses with PRO-scale as the dependent variable and a number of stress factors as the independent variables. Stressful events are more likely to happen to low-PROs (negative coefficients for likelihood of occurrence) but are more stressful to high-PROs (positive coefficients for stress upon occurrence).

Category	Item	low-PRO-A	low-PRO-B	Total av.	prob.
Basic variables	Gender (Male=0, Female=1)	0.21	0.55	0.53	**
Religion	How often attended services?	0.13	0.06	0.44	*
	Thinks is a religious person	0.41	0.20	0.43	**
	Among friends, importance of religious activity	0.21	0.04	0.33	**
	How much religion affects decisions	0.31	0.15	0.46	**
Self-esteem	R feels good about self*	0.83	0.60	0.73	***
	R feels s/he is a person of worth*	0.83	0.56	0.73	***
	R able to do things as well as others*	0.80	0.63	0.74	***
	On the whole, R is satisfied with self*	0.86	0.53	0.70	***
	Feels useless at times	0.40	0.55	0.45	**
	At times thinks s/he is no good at all	0.30	0.47	0.41	**
	Does not have much to be proud of	0.22	0.40	0.34	***
	R usually feels emotionally empty	0.27	0.42	0.34	*
	Feels empty about the future	0.14	0.27	0.25	*
Control	Should have baby only after marriage	0.77	0.65	0.65	*
	I energetically pursue my goals*	0.79	0.69	0.73	**
	Lots of ways around any problem*	0.76	0.65	0.69	**
	I know I can solve problems*	0.74	0.59	0.67	***
	I meet the goals I set for myself*	0.71	0.57	0.65	***
	Prepared for the future*	0.73	0.44	0.64	***
	Parents check about homework	0.45	0.24	0.45	**
	Good luck more important than hard work	0.28	0.40	0.32	*
	Others stop R from getting ahead	0.35	0.46	0.40	*
	Plans hardly ever work out	0.29	0.47	0.37	**
	When makes plans R is certain they will work	0.73	0.51	0.64	***
	Many ways to get important things in life	0.78	0.67	0.70	**
	Things do not go as planned	0.40	0.54	0.56	*
	Confident about the future	0.76	0.60	0.71	**
	Worried about the future	0.45	0.60	0.56	*
	Powerful about the future	0.57	0.43	0.57	*
	Hopeful about the future	0.80	0.65	0.77	**
Trust	Misbehaving students often get away with it	0.62	0.49	0.53	*
	How many teachers listen to R's problems	0.56	0.34	0.47	**
	R things others see R as trustworthy	0.84	0.71	0.75	*
Stress	Got into a physical fight in school	0.00	0.12	0.11	*
	R feels stressed	0.42	0.59	0.52	*
	R feels tired	0.54	0.69	0.55	*
	R feels relaxed	0.63	0.46	0.56	**

Table 3. Significant differences (based on ANOVA) between two types of low-PROs, whose mean values sometime straddle the average for the total sample population.

Category	Item	high-PRO-A	high-PRO-B	Total av.	prob.
Religion	How often attended services?*	0.37	0.83	0.44	***
	Thinks is a religious person*	0.35	0.80	0.43	***
	Among friends, importance of religious activity*	0.18	0.58	0.33	***
	How much religion affects decisions*	0.33	0.87	0.46	***
	How much religion affects future job*	0.13	0.80	0.38	***
	Depend on science too much vs. faith*	0.35	0.75	0.48	***
Self-esteem	Feels useless at times	0.54	0.35	0.45	**
	At times thinks s/he is no good at all	0.46	0.25	0.41	**
	R usually feels emotionally empty	0.29	0.15	0.34	*
Control	Tries as hard as possible in math	0.75	0.88	0.76	*
	Parents assign household chores	0.72	0.88	0.72	*
	Parents limit TV watching/video game time	0.22	0.42	0.27	*
	R does not have enough control over life	0.31	0.16	0.37	*
	I energetically pursue my goals	0.78	0.88	0.73	**
	I know I can solve problems	0.68	0.79	0.67	*
	Worried about the future	0.62	0.48	0.56	*
	Prepared for the future	0.61	0.76	0.64	**
Support	Neighbors know who R is	0.59	0.76	0.60	**

Table 4. Significant differences (based on ANOVA) between non-religious (A) and religious (B) high-PROs, whose mean values sometime straddle the average for the total sample population.

Item #	Item	PROcorr	Sig	low-PRO	high-PRO
1	How well were you concentrating?	0.225	****		
2	Were you living up to the expectations of others?	0.262	****		
3	Was it hard to concentrate?	-0.023			
4	Did you feel self-conscious or embarrassed?	0.025			
5	Did you feel good about yourself?	0.111	*	A>B*	
6	Did you enjoy what you were doing?	0.091			B>A**
7	Were you living up to your expectations?	0.179	***		B>A**
8	Did you feel in control of the situation?	0.051			
9	Did you expect to get what you want easily?	0.071			
Describe your feelings as you were beeped on scale from..					
10	Sad-Happy	0.149	**		B>A**
11	Weak-Strong	0.105			B>A***
12	Passive-Active	0.114	*		B>A**
13	Lonely-Sociable	0.194	***		B>A*
14	Ashamed-Proud	0.094			B>A*
15	Detached-Involved	0.179	***		
16	Bored-Excited	0.159	**		B>A*
17	Confused-Clear	0.053			B>**
18	Worried-Relaxed	-0.014			
19	Competitive-Cooperative	0.105			B>A**
20	Discouraged-Hopeful	0.098			
21	Tired-Alert	0.097			
Indicate how you felt about the main activity					
22	Challenges of the activity	0.146	**		
23	Skills in the activity	0.065			
24	Was this activity important to you?	0.229	****		
25	How difficult did you find this activity?	0.127	*		
26	Were you succeeding at what you were doing?	0.085			
27	Did you wish you had been doing something else?	-0.092			
28	Was this activity interesting?	0.151	**		
29	How important was it to your future goals?	0.146	**		
30	How angry did you feel?	-0.023			
31	Were you making the best possible use of your time?	0.229	****		
32	What did the people you were with think of you?	0.122	*		
33	Did you feel any physical pain or discomfort?	-0.076			

Table 5. Experience sampling method items that are answered at roughly two-hour intervals for a period of a week. The PROcorr and Sig columns give correlation coefficients and statistical significance values for single factor regressions. Items 2, 13, 24, and 27 are retained in a stepwise multiple regression analysis, accounting for 12.2% of the variance in the PRO-scale. The low-PRO and high-PRO columns show the results of ANOVAs comparing the two groups of lo-PROs and high-PROs .

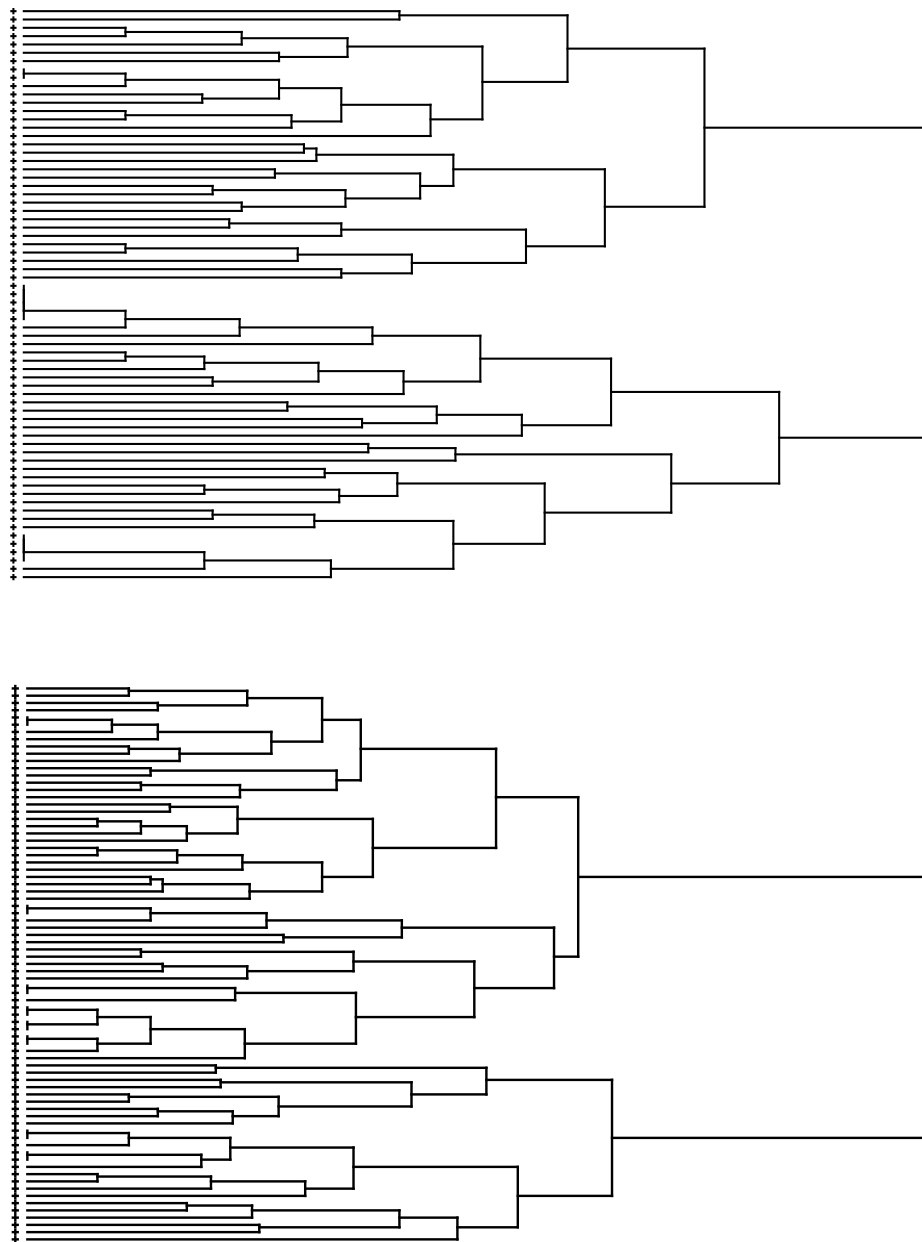


Figure 1. Cluster analyses discriminating two kinds of low-PRO (top) and high-PRO (bottom) individuals.