Risk Perception and Sense of Security and Their Measurements

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1 Research Review of Risk Perception and Security

Risk is an object studied by many disciplines in social sciences but also in natural sciences. The universality of these disciplinary studies forms the diversity of the concept of risk. Different disciplines and researchers define risk from their own perspective. Therefore, the concept of risk is still disputed, and there is no recognized definition. In social sciences, the concept of risk is also entangled with "danger", "disaster", "safety/non-safety", "uncertainty", etc.

Risk research can roughly be divided into risk analysis, risk assessment, risk decision, etc. Psychological risk research is divided into two levels, i.e., objective and the subjective studies. Risk perception belongs to the latter (Xie 1998).

1.1 Sociological and Psychological Study of Risk Perception

1. **Topics**

Studies on risk perception generally fall into sociological risk studies, psychometric paradigm studies, and sociological and cultural studies.

Rohrmann and Renn (2007) argue that risk perception refers to people's judgments and assessments on risk that is affecting or likely to affect them (or their facilities or environment). In their opinions, experience and belief should be taken into consideration in the study of risk perception. Due to the disciplinary characteristics of natural sciences and social sciences, there must be great differences or even conflicts in risk perception. Studies in different disciplines are certainly lim-
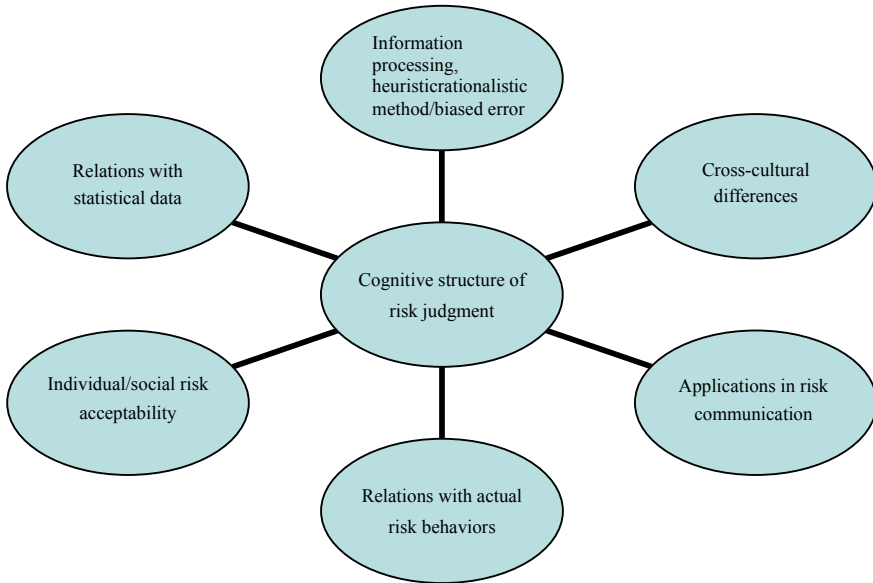
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Fig. 1 Different risk perception topics. *Source* Rohrmann and Renn (2007). The shape of the graphic has been slightly modified

ited by their own disciplinary characteristics. Besides, researchers believe that risk perception encompasses complex discussion topics, as shown in Fig. 1.

Rohrmann and Renn (2007) argue that "perceived risk" often brought up by people actually refers to the judgments and assessments on the scale and level of more specific risks as well as the acceptance to these risks.

Rohrmann and Renn (2007) also argue that study of risk perception can be divided in three dimensions, namely: danger (risk source), risk judgment, and characteristics of respondents (Fig. 2).

With regard to the first dimension—risk source, they put forward three descriptive strategies, i.e., theme, affected types, and consequences. Such classification is shown in Fig. 3.

The second dimension is risk judgment. They proposed some significant factors for judging risk, such as risk level, qualitative features, and relation between risk and benefit as well as between individual and risk, and acceptance, as shown in Fig. 4.

Both sociological and psychological studies pay much attention to culture, but the difference lies in that the cultural school of sociology only admits to the existence of risk culture but not risk society. However, positivist studies regard culture as an influence. Rosa (2007) believed that there are two mutual-competitive hypotheses in risk perception research: first, as a single species, human beings select a common perceptive cognitive structure, and thus the basic risk perception is almost the same in every culture; second, human perception is profoundly related to cultural significance, thus the difference in different cultures. Besides, it has been found through
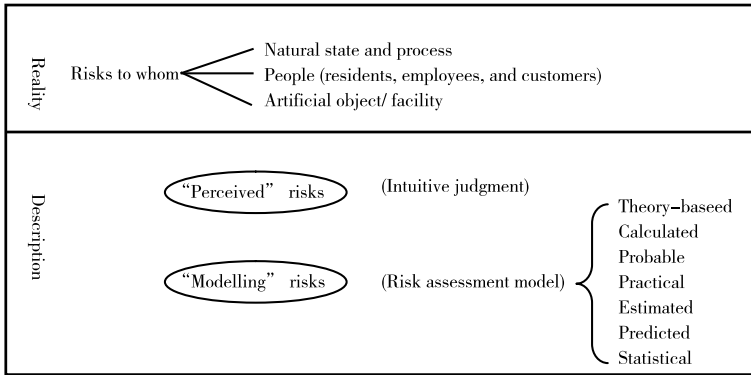
Fig. 2 Perceived "genuine" and modelling risk. *Source* Rohrmann and Renn (2007)
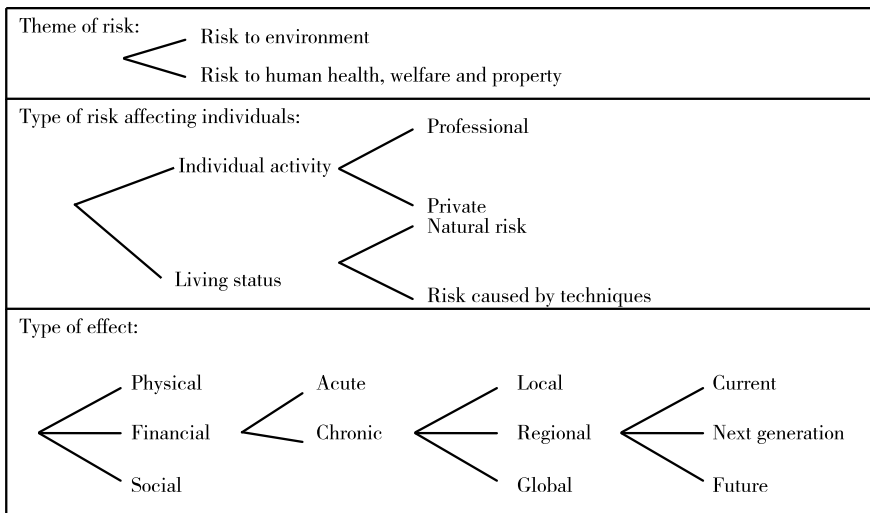

Fig. 3 Risk source classification. *Source* Rohrmann and Renn (2007)

cross-cultural studies that American culture is similar to Japanese culture in terms of risk perception schematism.

2. **Psychometric paradigm-based study of risk perception**

The theoretical structure of the psychometric paradigm affirms that risk is defined subjectively, which is influenced by various factors such as psychology, society, institutions, and culture. It is thought that as long as research tools are reasonably designed, the factors that decide risk perception and their internal connections can be quantified (Slovic 2005).

Starr measured risk perception by comparing acceptable risk and benefit thereby trying to answer a most typical question in risk research—"how safe is safe enough?"

Risk Level
>Scale of risk: overall risk assessment
>Estimated annual mortality
>Probability of (an individual) suffering from calamity; reduced life expectancy
>Risk of health damage
>Potential avoidance of incidents or disasters
>Potential for disaster: death toll caused by a kind of disaster
Qualitative Features of Risk
>Degree of fear; fear association; horror
>Familiar/unfamiliar; affection of self-understanding; imagination of danger
>Observable/non-observable (consequences and results)
>Controllable/uncontrollable
>Scientifically known/unknown
> Immediate/delayed consequences
>Influence on future generations
Profit
>Personal profit provided by risk sources
>Attraction of risk activities
>Contribution of social returns to human demands
>Correlation with human demands
>Equilibrium between risk and profit
Relations between an individual and risk
>Voluntary/involuntary effects; individual effects on choices
>Concern extent; anxiety
>Degree of an individual being affected
> Risk reductionactivities taken part in byan individual; actions taken
>Suitable distance to dangerous facilities
Acceptance
>Degree of willingness to pay for (risk reduction)
>Suitable level of regulation
>Risk acceptance: individual perspective
>Social acceptance of a certain risk

Fig. 4 Correlated risk variables—risks judged by respondents. *Source* Rohrmann and Renn (2007)

He found that the acceptability of risk is roughly proportional to the third power of the benefits; the public seems willing to accept risks from voluntary activities roughly 1000 times more than it would tolerate risks providing similar benefits from involuntary activities; the acceptable level of risk is inversely related to the number of people exposed to that risk (Slovic 2005).

Slovic et al. found that the probability of risk estimated by people is moderately related to the actual accident rate. Risk estimations by different groups show a high degree of consistency. To disclose the difference, Slovic et al. designed a set of scale, asking subjects to estimate various risks, including annual accident rates, potential risks of natural disaster, controllable degree of particular incidents, and familiarity degree of some risks, etc. Through the analysis of these factors, he worked out two dimensions of risk perception—dread risk and unknown risk. The former is connected with degrees of catastrophe and uncontrollability, and the latter represents familiarity (Xie 1998).

Yu and Xie (2006) adopted a multidimensional psychometric paradigm to study the cognitive characteristics of the public towards 39 environmental risks in six dimensions, i.e., large or small influence, controllability or uncontrollability, familiarity or strangeness, short or long duration, high or low possibility, severe or light consequence, as shown in Table 1. In their analysis, they divided environmental risks into three categories—ecological environment, disease and disaster, and living environment. According to the results, in terms of the cognitive characteristics of these three environmental issues, risk perception for "disease and disaster" in most dimensions is significantly higher than the other two categories; that of "ecological environment" in many dimensions is evaluated as high risk; and that of "living environment" in most dimensions is at a lower level.

In the study by Xie and Xu (2002), subjects were asked one by one to assess the risk level of the 46 risk sources in each risk characteristic dimension. The risk level is divided into: the degree of influence caused by risk factors on people, the severity of the consequences caused by risk factors, and the probability of the consequences caused by risk factors. The dimensions of risk characteristic include: controllable or uncontrollable, known and familiar or new and strange, common and ordinary or disturbing and worrying, immediate or delayed, temporary or permanent, artificial or natural, and individual or social. The results show that the assessment of public or social risk is generally higher than that on personal risk; people's individual risk factor perception contains obvious low-risk factor groups. With respect to social risk factor perception, people's individual risk factor perception stands at an intermediate state. In terms high-risk sources, social and individual high-risk factors overlap each other and, with the exception of natural disasters, other factors are usually social problem closely related to personal life. They also found that factors such as personality, risk-taking tendency and perception on risk character affect each other and jointly exert an effect on the risk perception structure.

After that, they chose 28 risk sources graded highest among the 46 sources, and asked subjects to rank risk factors with level-10 measurement and comprehensively consider this gradation from three aspects, namely social life influence, severity of risk result, and likelihood of risk result. The results show that railway transportation is perceived to have the lowest degree of risk while high-risk sources include social morality corruption, overpopulation, economic crisis, war, civil unrest and nuclear war, as shown in Table 2.

Shi et al. (2003) used the method of stratified sampling to study risk perception characteristics and the psychological behaviors of 4,231 citizens in 17 cities during the 2003 SARS epidemic. According to the risk perception model of Slovic, they adopted two risk measurement indexes—familiarity and control—to study six categories of risk events, namely the cause of SARS, transmissibility and infectivity, recovery rate, preventive measures, the effect on body after recovery, and infectivity after recovery, using the Likert five-point scale for measurements. The results have shown that people's perception of the degree at which these could be controlled ranked, from high to low, as follows: preventive measure and result, infectivity after recovery, effect on body after recovery, transmission route and infectivity, recovery rate, and cause of SARS, as shown in Table 3. The public's risk perception of the

Table 1 Analytical results of environmental risk factors

1. Environmental and ecological		2. Diseases and disasters		3. Residential environment	
Pollution type	Risk index	Pollution type	Risk index	Pollution type	Risk index
Underground water pollution	809	Circulatory system diseases	850	Noises from boiler room	759
Wastewater effluent in rivers	767	Communicative diseases	837	Railroad transportation	701
Drinking water pollution	734	AIDS	807	Noises from renovation and construction	689
Pollution from used batteries	733	Bacteria and Microorganisms	735	Cooking fume pollution from commercial kitchens	596
Impact of lead on human health	728	SARS	719	Visual pollution	596
Pollution from chemical plants	713	Earthquakes	653	Second-hand smoking	524
Unsustainable exploitation of natural resources	691	Flooding	591	Roadside and inland water body garbage dumping	512
Decontaminating toxic wastes	688			GM foods	427
Land use for illegal purposes	687				
Threatening endangered species	676				
Ozone layer destruction	674				
Radiation from construction materials	646				
Medical wastes	613				
Airborne pollution	604				
Overfishing	585				
X-ray radiation	585				

Table 2 Average level of risk perception

	N	M	SD
Railroad transportation	836	4.93	2.50
Nuclear power station	835	5.07	2.63
Family disintegration	839	5.38	2.53
Political and economic reform	833	5.52	2.34
Housing shortage	845	5.67	2.48
Drug use	843	5.71	2.54
Fires	842	5.79	2.38
Traffic accidents	843	5.79	2.38
Flooding	842	5.92	2.27
Electric power	837	5.92	2.37
Diseases	840	6.02	2.61
Inadequate healthcare infrastructure	842	6.06	2.21
Political interference	842	6.06	2.34
Low income	843	6.18	2.51
Counterfeit and inferior products	843	6.32	2.32
Earthquakes	843	6.32	2.71
Inflation	843	6.51	2.14
Crime	840	6.70	2.14
Energy crisis	838	6.76	2.15
Food shortage	838	6.89	2.51
Environmental pollution	844	6.95	2.10
Poor public safety conditions	843	6.96	2.02
Prevalence of perverse social norms	844	7.14	2.05
Overpopulation	843	7.25	2.28
Economic crisis	842	7.36	2.07
War	839	7.59	2.73
Domestic unrest	840	7.82	2.42
Nuclear warfare	842	7.82	3.08

SARS epidemic in early May was at the right upper end of risk factor space; that is to say, it tended to be at the end of complete familiarity and complete control. But the cause of SARS was distributed amid the incontrollable and strange quadrant; that is to say, "People feel that the cause of SARS is the most dangerous. Effect on body after recovery and the infectivity are distributed amid the strange and controllable quadrant; that is to say, although people feel unfamiliar with these two risk events, they feel that these problems are controllable. Other events (infectivity, preventive result and recovery rate) are distributed amid the controllable and familiar quadrant"; that is to say, people feel that they are more familiar with these three types of problem

Table 3 Risk perception among the public

Risk incidents	Degree of familiarity		Degree of control	
	M	SD	M	SD
Causes of SARS	2.95	1.065	2.74	0.885
Infection mechanism and contagiousness	3.73	0.821	3.13	0.797
Recovery rate	3.21	0.834	3.13	0.736
Prevention measures and effectiveness	3.54	0.798	3.38	0.732
Health effects post-recovery	2.65	0.983	3.23	0.920
Likelihood of infection after recovery	2.76	1.036	3.28	0.978
Overall view about SARS	3.35	0.750	3.36	0.766

Note The larger the number the greater familiarity or control a subject has with or over the topic, and the lower their risk awareness level
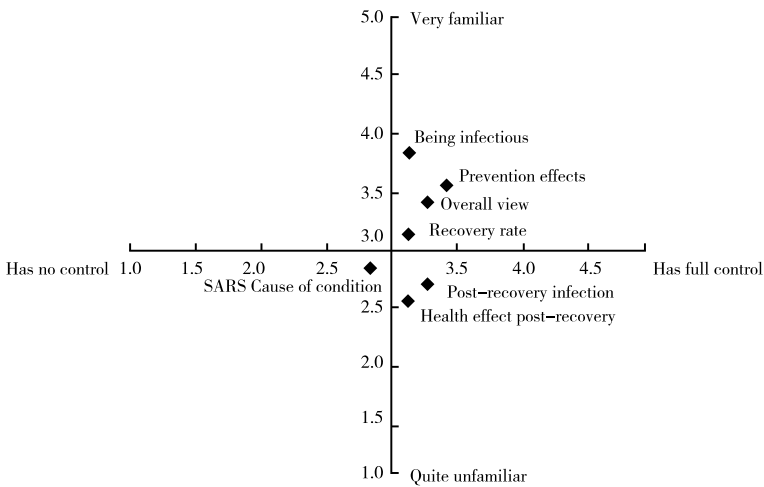

Fig. 5 Mapping risk perception of diseases among the public

and that they can control the problems. Therefore, the corresponding risk level is low, as shown in Fig. 5.

Wang (2011) collected and classified common and representative risk sources in daily life, selected the following 69 risk sources, and divided them into two categories including seven types (as shown in Fig. 6):

(1) **Natural disasters**: thunder, landslide, earthquake, flood, and typhoon;
(2) **Accidents**: fire, toxic gas leakage, nuclear leakage, traffic accident, mining accident, gas explosion, cancer, AIDS, infectious diseases, and wild dog bite;
(3) **Social risks**: criminal damage, terrorist attack, riot, social unrest, living and working pressure, economic crisis, declining stock-market, war, nuclear
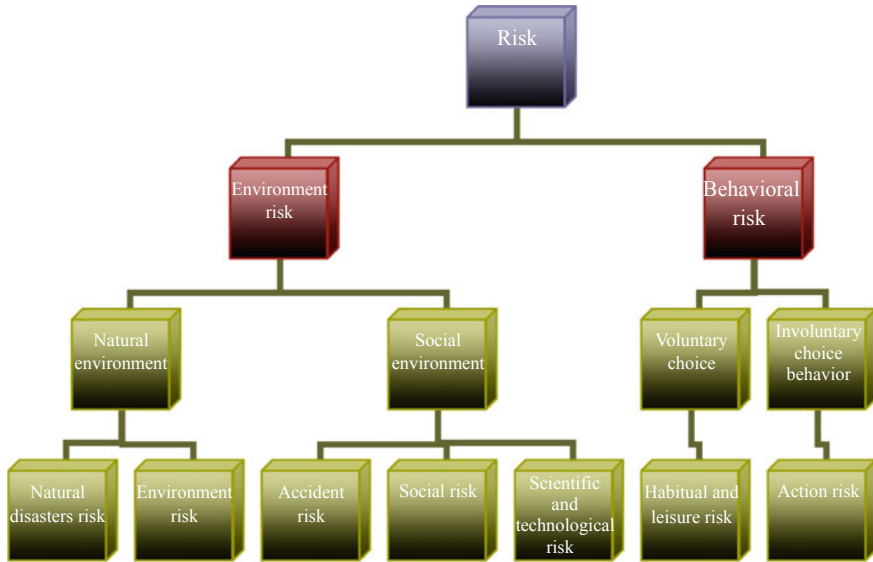
Fig. 6 Risk source classification

weapon, network hacker attack, illegal photographing, unhealthy food, shooting incident, and bomb;

(4) **Scientific and technological risks**: electric shock (by electric appliance), X-ray, formaldehyde, firecracker, antibiotic, chemical fertilizer, pesticide, food preservatives, vaccination, explosives, genetically modified food, high-tension power lines, automobile exhaust, and residual pesticide in vegetable;

(5) **Environmental risks**: ozone depletion, river, lake and sea pollution, air pollution, and waste management plant;

(6) **Action risks**: taking a plane/train/car/lift, taking medicine/traditional Chinese medicine, driving, sailing, cycling, taking surgery/blood transfusion, aloft working, walking across the street, mobile phone radiation;

(7) **Habitual and leisure risks**: gambling, bungee jumping, mountaineering, riding rollercoasters (in amusement parks), swimming, taking drugs, smoking, and infidelity;

A questionnaire survey was conducted from November 2009 to January 2010 on 600 college students and 600 citizens from Beijing, Nanjing, Chongqing and Xiamen, obtaining 1,144 valid results. In the survey, respondents were asked to assess 69 risk sources listed in the questionnaire in accordance with their own experience. Risk assessment was ranged on seven levels, from "extremely high risk" to "very high risk", "high risk", "medium risk", "slight risk", "little risk", and "absolutely safe". Table 4 shows the average score for the risk assessment of the top ten risk sources in the survey.

Table 4 Top ten risk sources

	Number of samples	Average	Standard deviation	Type of risk
Nuclear leakage	1,139	5.23	2.224	Accidents
Toxic gas leakage	1,141	5.11	1.808	Accidents
War	1,143	5.06	2.213	Social risk
Gas explosion	1,139	5	1.915	Accidents
Nuclear weapon	1,138	4.94	2.247	Social risk
Infectious disease transmission	1,139	4.9	1.475	Accidents
Terrorist attack	1,141	4.78	2.022	Social risk
Earthquake	1,138	4.76	1.725	Natural disasters
Cancer	1,139	4.76	1.975	Accidents
Traffic accident	1,140	4.74	1.482	Accidents

The averages of the top ten risk sources range from 4.74 to 5.23, fluctuating at a "high risk" level. The two most dangerous risk sources are nuclear leakage and toxic gas leakage. Among the ten risk sources, only earthquakes belong to natural disaster, while other risk sources belong to accidents and social risks. Generally speaking, these risks are highly lethal. Except for cancer and traffic accidents that may affect only an individual at a single time, other risks are massively destructive. These risks are unpredictable and uncontrollable for common people, and make common people completely passive.

1.2 Studies of Security

With the development of science and technology and the occurrence of social changes, risks perceived by the public are increasing, and insecurities are no longer limited to the domain of public safety. The insecurity of the public is also affected by society, politics, economy, ecology, individual rights, and information. Meanwhile, study of security is no longer limited to its original scope and understanding and studying security from a macroscopic perspective has become inevitable. When "unsafe" and "risk" become the core features of modern society, security becomes a problem that everyone has to face. Since insecurity is absolute while security is relative, society can only provide limited security to satisfy the requirements of the public, which makes the problem of security a subjective one in a qualified objective social situation; namely it is an issue of "how safe is safe enough" as proposed by Douglas (1992). Today, study of safety and security should not only pay attention to mental health and social security, but also care about the primary demands of people,

and focus on policy-making for socio-economic development and social security so as to avoid and relieve risks and reduce insecurity and anxiety.

1. **Individual safety**

Except for behaviorism, in the three major schools of psychology, both the psychoanalytic theory and the humanistic psychology theory attach great importance to the concept of security. The psychoanalytic theory emphasizes the role of early experiences in the formation of security, regarding the sense as a measurement index of mental health. In Alfred Adler's opinion, children who have physical defects and congenital deficiencies may develop an inferior relation with their environment, and such inferiority may be characterized by cowardice and insecurity (Gao 1982). Horney, K. thought that in modern civilized society, feelings such as estrangement, hostility, resentment, fear and loss of confidence prevail among people. If these feelings are gathered up, insecure feelings such as isolation and helplessness will generate and make people think that they are living in a potentially hostile world filled with risks, thus leading to the formation of basic anxiety, or even causing neurological disorders (Gao et al. 1987). Horney considered that children must seek for safety in their environment as they are small and weak and incapable, and this basic security need is the main driving force for personality development. People are born with a primary motivation to seek safety and avoid fear and threat. Fear caused by unsafety leads to anxiety. For a child, basic anxiety comes from parental attitudes towards the child in a family context. Basic anxiety also urges an individual to seek a safe way of life (Gao 1982, 1987). Humanistic psychology also regards safety as a basic human need, and security as a personality trait which is an important factor determining mental health.

In their review of the study of security, Cameron W. and McCormick T. pointed out that the concepts of security and insecurity were first used by Thomas W. and Adler. Adler used it to express inferiority caused by inadequacy, while Thomas treated security as an individual's hope to express basic security needs. Cameron W. and McCormick T. thus understood the concept of security: (1) The pursuit of security is the basic driving force of human beings, and security is a goal; (2) Insecurity may be emotional reaction to sudden external threats, usually referring to threats caused by crisis not leading to daily terror, such as traffic accidents, fire, war, earthquakes, pests, etc. Therefore in this case, it is also known as temporary insecurity. (3) Insecurity may come from relatively constant external threats, putting greater emphasis on the environment rather than individual responses, often referring to the insecurity caused by socio-economic factors, such as unemployment, low income, social change, etc. (4) Insecurity may stem from competition and inferiority. In social competition, this feeling may arise from comparison with other people. Some researchers believe that such insecurity arises more easily from social risks rather than physical risks. If there is no social security, there is no personal security. Howe E. thought that security could be obtained by reducing expectations to the level of being hardly ever disappointed. (5) Insecurity may come from internal threats and, in this case, is regarded as the internal personal characteristics mainly determined by early growth experiences independent of external conditions. Plant James argue that both security

and insecurity are psychological states established in the early life of an individual, so breast-feeding and embrace are important for the formation of security, whereas insecurity is hardly curable by medicine. (6) Security may be a faith, especially with the function of a religious faith. (7) Insecurity may not be conducive to the healthy development of personality. It is thought that insecurity may lead to mental illness and may be the sign of personality disorders and neurosis. (8) Insecurity may be regarded as particular behaviors, specifically as the cause of pathological behaviors or particular attitudes. For example, insecurity leads to anti-social behaviors, excessive fantasies, dictatorship, etc.

Obviously, the above types of security are not independent but mutually inclusive, and they can be simply divided into the two categories of internal insecurity and external insecurity. The former refers to insecurity in relation to individual characteristics (in terms of personality), meaning that it is early experiences that make people feel insecure rather than danger or risk in their surrounding environment-. The latter refers to insecurity caused by external factors. Some are temporary environment changes, while others are relatively lasting social environment pressure or interpersonal pressure.

Giddens also made a distinction between these two types of security, and he referred to internal security as *noumenon* security. *Noumenon* security corresponds to security from the psychological point of view of personal characteristics. Giddens' thought mainly comes from that of Erickson, another representative psychoanalyst. Giddens absorbed Erickson's views and came to the conclusion that basic trust is the foundation of *noumenon* security. He believed that *noumenon* security in the pre-modern society mainly stemmed from four types of trust: affinity, geography, religion, and tradition. However, these factors have lost their original significances in modern society. Consequently, *noumenon* insecurity levels in the modern society are higher than in the vast majority of pre-modern social environments (Giddens 1998, 2000).

Giddens distinguished two typical types of security—security as individual psychological characteristics and security as social mentality. At the same time, he also regarded security not only as an influence from early experience in childhood, but also as the result of social environment influence. Moreover, in the modern social environment, the distrust people feel may be the cause of their insecurity and long-time insecurity may cause *noumenon* insecurity. This is to say, insecurity is not a sensation towards the external environment but is internalized as individual insecurity.

2. **Social security**

Vail (1999) claimed that modern society has entered "insecure times", and insecurity has penetrated into people's living structure and become the template for daily experiences, expectations, and dreams. This insecurity does not only harm individual lives, but also disrupts individual self-worth and self-esteem, resulting in intolerable fear, anxiety, hopelessness, and inability.

But such a statement raises a question on whether our modern days are "insecure times" or a "time of insecurity"? That is because the most puzzling issue in security research is the relation between the secure state and security, namely the relation

between safety and security. In English, security has the meanings of safety and security. In order to distinguish the two, Howard (1999) used the feelings of insecurity to represent insecurity and used feeling safe and being secure to distinguish security and secure state. He asked: why is it that in a same society, some people are racked with anxiety for a long time and see threats and risks everywhere, while other people hardly think about these things and have much confidence even when they are in danger? Is there is a correlation between the secure state and security? Is it a positive correlation or a negative correlation? He used relative insecurity to illustrate this problem, thinking that there is no absolute insecurity, and that the level of insecurity is based on certain times and places. In addition, an increasing secure state may boost people's expectations, making them become more vulnerable.

From the perspective of social change, although many dangers of the pre-modern society have been reduced in the modern society, we may wonder why the security of modern people has lowered. For Giddens even though people no longer face pre-modern dangers, they are still facing modern reflective threats and dangers, namely risks. In other words, safety is to danger what security is to risk.

In fact, Vail's concept of "insecure times" is put forward from the perspective of the risk society, which places more emphasis on security or "feeling safe". In his opinion, the term "insecurity" can be used interchangeably with that of risk, anxiety, uncertainty, and other synonyms (Vail 1999). Risk implies danger, or threats to people's livelihood, which is uncertain and a probability but can be calculated. He thought that security/insecurity could be defined in essentially three ways. First, security is a sense or state of wellbeing or safety while insecurity is a sense or state of precariousness and fear. Second, security is the self-assurance and confidence of being able to achieve one's goals, of being able to "secure" a favorable outcome; insecurity is a feeling of hopelessness, a sense of self-constriction and a belief in the futility of advancement. It is also a sense of powerlessness, an inability to realize one's goals or protect one's interests as well as a heightened awareness of vulnerability to events and forces over which an individual has no control. Third, security is a condition for stability and permanency, as well as individual's continuous expectation for reliable surroundings and relationships; insecurity is a feeling of uncertainty about other people's activities or intentions, or the unknown.

Vail held that security and insecurity can be described from the following aspects, and each aspect is like two extremities of a spectrum: (1) Personal security/insecurity, health, sufficient food and accommodation, physical safety in one's home, workplace, community; (2) Economic security/insecurity, which may involve financial security, job security, protection of individual property rights or land use patterns, or investment in human capital; (3) Social security/insecurity, such as minimum protection (or lack thereof) offered by the state to individuals; (4) Political security/insecurity, including assurance of the public order and prevention of threats to the legitimacy or stability of polity and national security; (5) Environmental security/insecurity, i.e. the way in which social actors interact with their natural environment. Such definitions of security symbolize a turn in the study of security (insecurity), where its focus has switched from personal life and property safety of social order to the more broadly field of human beings' basic needs. But we should see that if security is

measured by using the above points, the degree of security/insecurity is relative. It is difficult to determine what state fosters absolute security or insecurity. Zender (2000) mentioned that in discussions on security, the most prominent feature is the lack of clear implications. In other words, security becomes an ideal or a target to aim for, yet is difficult to define. Nevertheless, the most effective definition of security is via its opposite, namely insecurity. Or we can say that security "is not about something good happening, but about something bad not happening". It is also for this reason that Giddens (2000) defined safety as a situation in which a series of particular dangers have been eliminated or reduced to the minimum. However, this minimum level is also difficult to be defined. We still need to judge it with the help of subjective feelings of safety, which are closely related to the individual's perception of risk.

1.3   Risk Perception and Security Measurement Methods

Studies of social mentality pays more attention to social security than on individual security; nonetheless study of social security cannot be regarded as isolated content. With the development of the risk society theory of sociology, both security and risk have become inseparable.

Past studies on risk perception mainly adopted the psychometric paradigm. Their problems included an oversimplification of the description of risk source resulting in the difficulty for respondents to give their assessments, and the neglected situationality of risk. Assessment is not easily provided as risk sources are many and each of them can be associated with nearly 20 characteristics. Besides, in terms of assessment accuracy, a 0–100 scale and the ordinary five-point scale show no great difference. The social and cultural factors that affect risk perception should be especially incorporated into the scope of research.

Rohrmann et al. (2007) put forward the structure of the factors that affect risk perception and summarize the factors' four levels (as shown in Fig. 7), namely cultural background, social-political environment, cognitive-emotive factors and common heuristic method. The first level includes the collective or individual heuristic methods used in the formation of risk judgment by a group or an individual. Some studies show that the possibility and controllability of the sense of fear and ruin will affect people's risk perception. The second level is the cognitive and emotive factors that directly or indirectly affect the perception process by attaching specific weight to the common heuristic method. The third is the social and political structures of individual and group actions. The fourth is the cultural factors that control and decide the majority of low-level influences.

Future study of risk perception should adopt more comprehensive approaches, which should be more macroscopic and combined with theoretical research results and methods in terms of risk transmission, risk culture and risk society.
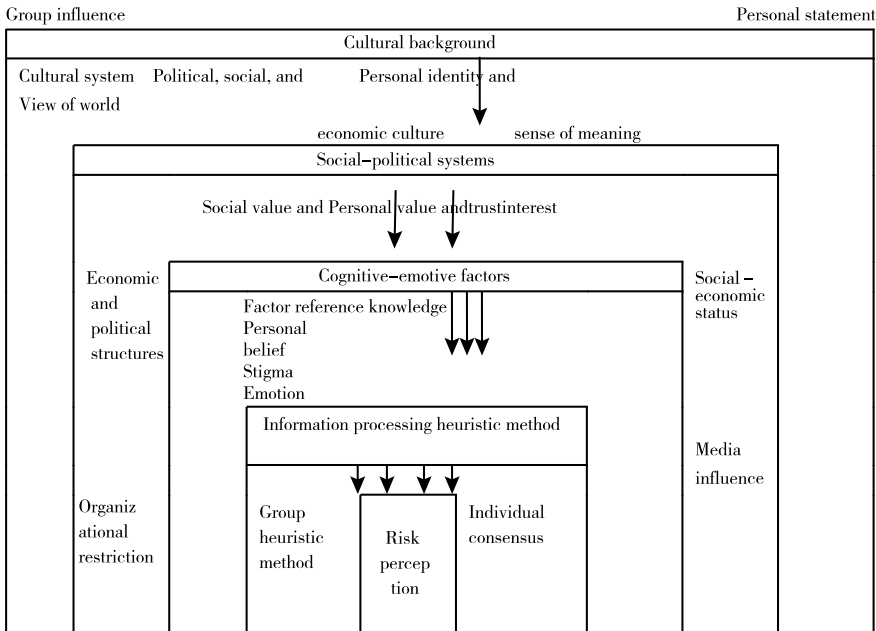
Fig. 7 Four background levels of risk perception. *Source* Rohrmann and Renn (2007)

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