

**RISK PERCEPTION AMONG HEALTH CARE WORKERS
EXPOSED TO IONIZING RADIATION
IN THE WORKPLACE**

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Abstract

The purpose of this paper is to examine how lay perceptions of risk influence individual behaviour. The study focuses on health care practitioners who are daily exposed to low levels of ionizing radiation. By using qualitative research methods, the goal was to understand how individuals attach meaning to the environment they work in, when there is a risk involved. It points out that people must go through a risk assessing procedure, in order to be able to deal with the daily risks to their health. People will develop different mechanism to cope with this daily risk. A model of risk perception was developed from this qualitative data. It is hoped that this model will contribute to the existing literature on risk perception models.

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I. Introduction

Part of human geography deals with the history of industrialization and its effects on urban society. Industrialization changed the urban environment. It has brought with it capital, higher living standards, and environmental contamination. When examining the effect of environmental contaminants on humans, most epidemiological studies have primarily focused on the biological effects of the contaminant. The measurement of morbidity or mortality due to contamination, fails to account for the psychological effect of exposure.

It is only recently that scientists have become more aware of the psychological effects of invisible contaminants. Exposure to an invisible contaminant causes a complex sequence of events to occur within an individual. The victims of nuclear exposure at Hiroshima, Three Mile Island, and most recently Chernobyl, show a remarkable consistency in the psychological effects experienced and in their methods of coping.

Lay concepts have previously been dismissed, because they do not conform to the appropriate biomedical behaviour. Biomedical research sees the lay perception as unscientific because it is not consistent with biomedical explanations of health. In order to make the connection between social interaction and people's health, researchers must examine people's experiences, how their reality is created and the cultural or gender variations within our society.

This study will focus on a small part of the psychological effects of exposure to low levels of ionizing radiation. This will be done by examining the risk perceptions of health care

workers exposed to ionizing radiation in their workplace. The goal is to understand how individuals perceive the risk of ionizing radiation in the workplace. This paper will show what risk perception is based on and how this affects individuals coping mechanisms.

The theoretical framework used for this paper is known as symbolic interactionism. Symbolic interactionism was developed by Cooley (1902), Dewey (1930) and Mead (1934-38) to explain the social meaning individuals attach to the environment around them. There are three components to the theory of symbolic interactionism.

First, people react towards things (radiation) based on the meaning they have for them. If radiation is seen as a useful tool for healing, then an individual will react differently from one who feels threatened by ionizing radiation. The individuals perception determines their reaction towards the ionizing radiation.

Secondly, meanings are social products. People will learn to see the world based on other people's reactions. Fear and anxiety can result from media reports on nuclear disasters. This often can cause an individual to question what is a safe dose of radiation.

Finally, individuals attach meaning to situations or things through the process of interpretation. Symbolic interactionism states that how an individual interprets the risk of radiation will determine their reactions and actions towards it. This is a dynamic process. Individuals are constantly finding themselves in different situations and thus are changing their

interpretation.

This paper hopes to clarify the process of risk perception by providing a model which incorporates the symbolic interactionist theory. The use of qualitative research methods adds a new perspective to the epidemiological approach in the study of risk perception. How health care practitioners undergo the process of interpreting risk in the occupational environment can provide us with a better understanding of accident prevention.

II. Literature Review

Within the study of geography, a logical split has occurred. This social science has been divided into physical and human geography. Human geography uses a behavioural approach for "understanding meaning, value and human significance of life events" within an environment (Johnston 1986, p. 207).

This study focuses on understanding the human perception of risk to an environmental contaminant within the occupational environment. Ionizing radiation is a workplace hazard that health care workers are frequently exposed to. Johnston (1986) states that "the whole question of how people, individuals and in groups, perceive environmental hazards has generated a large literature over the past two years" (Johnston 1986, p. 134). Scientists are recognizing the importance of understanding individuals perceptions about health risks seeing the reason for behaviour is rooted in these perceptions.

One sub-field of human geography is medical geography. Medical geography, states McGlashan (1972), is a borderline discipline that conceptually overlaps in geographic methodology for explaining health problems and medicine. Pyle (1976) feels that there is a increasing awareness to understand the geographical aspects of health problems. By examining aspects of human behaviour, we can come to a better understanding of particular health problems. Pyle indicates that while the epidemiological approach to study disease in geography is traditionally used, it is time, he feels, "to an overlapping of epidemiological and sociological explanations" (Pyle, 1976, p. 97).

This study of risk perception hopes to contribute to a small field of research in geography which relies on the behavioural approach. Gold (1980) states that behavioural geography is based on the idea that environmental cognition and behaviour are linked. The way in which people behave is affected by how they perceive the environment with which they are confronted. Since each person reacts differently when exposed to a health threat, how they respond or perceive this threat is highly variable (Taylor 1986). There is increasing awareness of the social and psychological variables when evaluating human behaviour. Medical geographers have come to recognize the behavioural approach as a valid approach to understanding human response to an environmental contaminant.

Eyles and Woods (1983) state that the reason for this is that individuals fail to react within the scope of what some classic theories purpose to analyze. No theory can predict human behaviour. Eyles and Woods also state that the behavioural approach allows us to focus our attention on the individual thus providing a valuable explanation of the unique behaviour of man in his environment. They use Phillips (1981) as an example of a researcher who emphasized "the individual as the unit of analysis" when studying socio-ecological behaviour (Eyles and Woods, 1983 p28).

This study will also look at lay perceptions. What are lay perceptions? What affects lay perception? Lay perceptions are peoples interpretations of their own reality. They have their own logic and within the context of their own lives, their beliefs seem perfectly valid. The interpretive paradigm

recognizes the importance of these beliefs in shaping the social world and influencing lay behaviour. Cromwell (in Eyles and Donovan, 1989) states that the interpretive paradigm sees people as social actors who produce and reproduce meanings that make up their social world. Lay beliefs are effected by gender, class and ethnicity (Eyles and Donovan 1989, Calnan 1987, Crawford, 1984).

Perception is seen by Gold (1980) as something specific. "It is the psychological function that enables the individual to convert sensory stimulation into organized and coherent experiences" (Gold 1980 p20). Gestalt theory (Gold, 1980) states that behaviour is mediated by the perceptual process. It is not caused by the stimulus but instead by the way in which the stimulus is perceived. It is a cognitive process which involves the personal belief system. How a person will perceive risk is based on this personal belief system.

When someone exposes themselves to ionizing radiation on a regular basis, they are said to be taking a risk. One of the components of this study on risk perception is to define risk. What is a risk? Brearley (1982) defines risk to be "the relative variation in possible loss outcomes" (Brearley 1982 p26). Risk is subjectively perceived, but it can be objectively measured. A person can be exposing her/himself to a risk without being aware of what s/he is doing or its consequences.

Brearley also describes risk taking behaviour. In order for behaviour to be risky, three elements must be present: "the actor must be conscious of the risk, the loss must be irreversible, and exposure to the loss is accepted in the hope of gain." (Brearley

1982 p25). Brearley describes risk as being undesirable, however, risk taking is perceived to be a desirable activity. An example of exciting risk taking occurs when an individual gambles or invests in the stock market.

Sjoberg (1987) agrees with Brearley but he furthers his explanation of risk to show that the greater the benefits the greater the level of risk endured. Sjoberg also proceeds to explain that risks are more acceptable if they are voluntarily undertaken as opposed to being enforced. The medical personnel exposed to ionizing radiation are in fact unconsciously making this trade-off to gain something. Sometimes the gain is in terms of money or in extending someone's life.

Vyner (1988) states that "when confronted with an invisible threat to one's health, some people will construct non-empirical belief systems as a form of knowledge about that threat" (Vyner 1988, p.24). Non-empirical beliefs systems are part of the personal appraisal of risks. They help the individual develop the best plan of action against what s/he perceives to be threatening.

Uncertainty about the risk of radiation exposure is part of the fact that it is an invisible contaminant. Vyner states that a contaminant is invisible if it cannot be detected by the human senses and this is part of the problem with perceptions of risk to radiation exposure. If individuals cannot see, feel or smell the risk, they are more likely to create an inaccurate belief system to justify the risk exposure. This study aims to better understand how these belief systems are developed and how they differ between individuals.

Greenburg(1987) looks at how risk evaluation by an individual involves weighing the benefits against the costs. He concludes that risk acceptability "involves values, attitudes and perceptions about risk."(p.250) This furthers the points made above. Is an individual making a risk trade-off if they smoke? Therefore is the exposure to ionizing radiation a greater concern for them. Do employees trade-off risks for income? Is this a reasonable thing to ask someone to do?

This brings us to the final piece of the puzzle. Taking what has been said about risk and perception, this research paper seeks to expand on the knowledge existing about perceptions of risk. Risk and perception are related in that no risk exists for an individual unless s/he perceives there to be one.

Blomvist (1988) writes that research in risk perception attempts to identify the underlying dimensions of perception. What would make a person fear other environmental risks when daily they are exposed to one? Does education influence this perception? This study seeks to answer questions centred on the social dimensions influencing risk perception.

Douglas (1985) feels that previous risk perception studies do not take into account the impact of social influences. She feels that risk perception is part of a social phenomenon and thus it must be studied in the context of the social sciences.

Edelstein (1988) states that two groups can view a risk from entirely different perspectives of what is an acceptable risk. He has found that a "given hazard is most acceptable to those farthest away and thus least vulnerable"(Edelstein 1988 p131). What may appear to be a relative risk by experts may very well be

an absolute risk to individuals. Those exposed to ionizing radiation in the workplace, are more likely to feel threatened by it because they lack control over it. Other health threats such as smoking, drinking or driving without a seat belt will appear to be less threatening because they can be controlled.

Edelstein makes a very strong point here that will be central to this study. If an individual is concerned about the effects of ionizing radiation, why do they sometimes fail to take the proper precautions to protect themselves? This is one of the most puzzling features of risk perception; why do people take risks with their health?

All of these articles provide pieces to the overall picture, however, as this area of research is still relatively new, the whole picture will not evolve until the study is finished. Part of the nature of man is his unpredictability. This literature review has attempted to fit the research topic within the framework of medical geography and to make some of the components of the research clearer.

III. The Nature of Ionizing Radiation

Ionizing radiation has been referred to as an invisible contaminant in the workplace environment. Vyner (1988) defines an invisible environmental contaminant to be a form of energy or a substance that is environmentally and medical invisible. It is impossible for the human senses to detect the invisible contaminant and the problem is that no one can detect if or how much exposure they are receiving from the environmental contaminant. The invisible contaminant does, however, produce disease that is also invisible for a while.

Ionizing radiation has also been referred by Vyner as being etiologically invisible. This means that the contaminant produces illnesses which are difficult to attribute to exposure to the contaminant. There is statistical evidence that ionizing radiation may cause leukaemia. These statistics are based on Hiroshima and Nagasaki survivors. Despite this it is not possible to prove that a specific case of leukaemia resulted from ionizing radiation.

The dangers of ionizing radiation can cause concern among employees whose workplace uses x-ray machines or cobalt machines. Ionizing radiation can cause somatic or genetic effects in exposed people. Studies indicate that exposed individuals are at a higher risk of getting cancer, although this may not appear until several years after being exposed. "All doses of ionizing radiation, no matter how small, pose some risk." (Pathak, 1989)

Radiation can be described as energy in transit; travelling as a wave or as a stream of particles. Ionizing radiation results when radiation comes in contact with the human body thus

producing an electrically charged matter called ions. This produce is referred to as ionization.

Ionizing radiation can be found everywhere. Figure 1 describes some typical doses of radiation that can be received in everyday situations. It comes from outer space and from the sun. The main sources of radiation exposure are alpha rays, beta rays, gamma rays and x rays. X ray machines use x-rays and cobalt machines use gamma rays. In the workplace exposure to radiation occurs in two way; externally or internally. External exposure occurs from being in an area where there are radioactive sources. If you inhale radon daughters, ingest or contaminate an open wound with radiation you are said to be internally exposed.

The health effects of radiation depend on the amount of radiation received and the length of exposure. Radiation can cause early effects or later ones which can occur from 5 to 30 years after exposure (Pathak, 1989). There is no real definition of what a low-level dose of radiation is. The annual dose of 5 rem per year is the currently acceptable level for workers in an occupational ionizing radiation environment. The average dose for individuals who do not work in this environment is 0.2 rem per year.¹

Present knowledge of the health effects of ionizing radiation are based on survivors of Hiroshima, patients who receive large doses as therapy, laboratory animals and from

¹. Leonard R, Solon. Health Aspects Of Low-Level Ionizing Radiation. Annals of the New York Academy of Science, 1987, 502:33.

SOME TYPICAL RADIATION DOSES RECEIVED

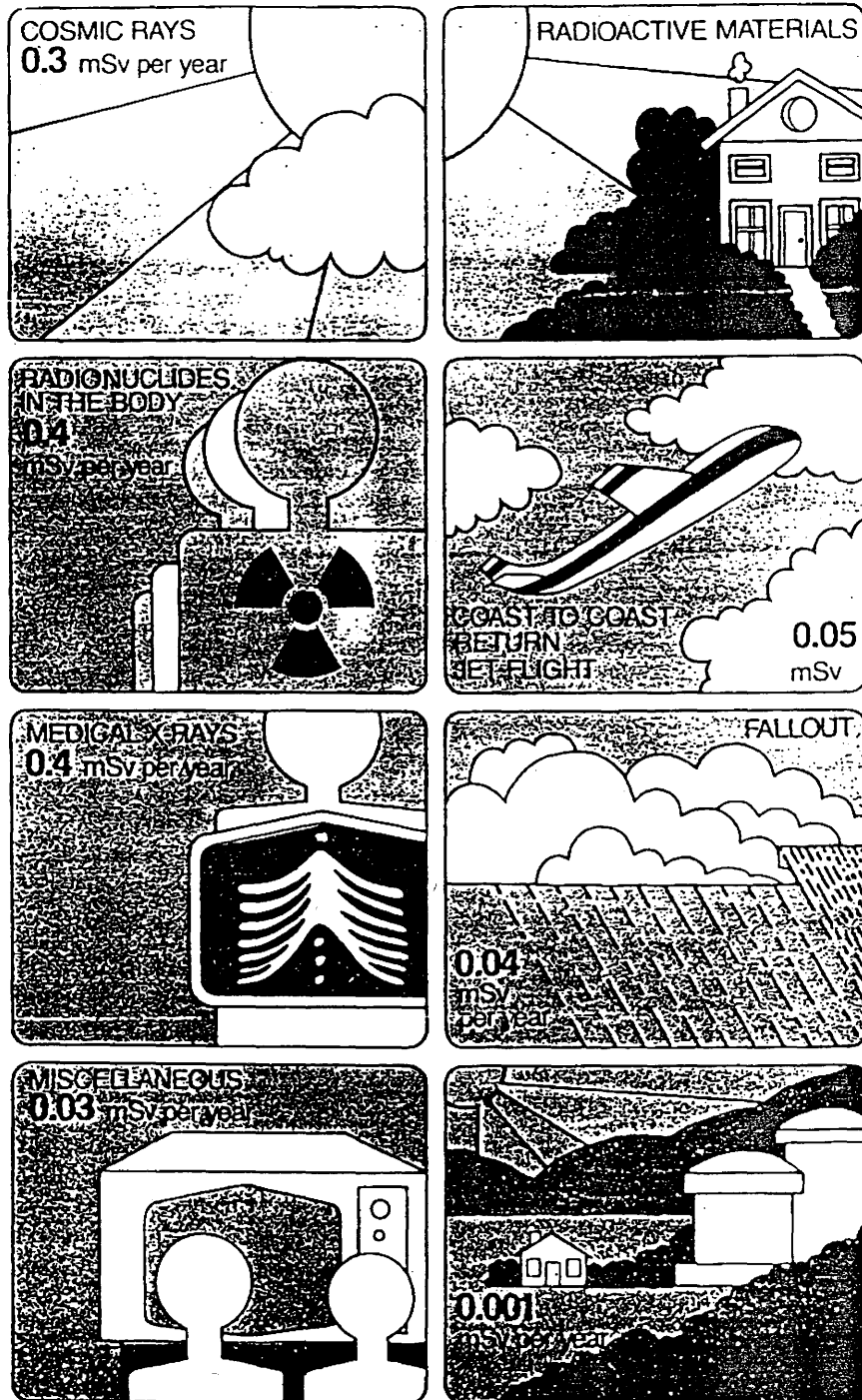


Figure 1. This figure illustrates some of the typical doses of radiation received from everyday situations.

Source: Canadian Institute for Radiation Safety, Dec. 1989.

workers in uranium mines. "People exposed to radiation are at higher risk of cancer" (Pathak 1989). For purposes of radiation protection the International Commission on Radiological Protection has based the mortality risk factor for ionizing radiation produced cancers at one case per 100 exposed people.

It is difficult for an individual to account for this evidence and still be able to work in the environment. Persons exposed in the workplace, to ionizing radiation are facing an adaptive dilemma. They must cope with the day to day reality of working in an invisibly contaminated environment. They must protect themselves from exposure and the health effects of the contaminant. While radiation protection awareness has increased within the hospital setting, individuals are still receiving higher than average total amounts of ionizing radiation.

IV. Methodology

The method used for this research is qualitative. Qualitative methodology refers to the collection of descriptive data: individuals own ideas. Concepts and ideas are a result of recurring pattern in the data. The research design is flexible to accommodate individuality. People and their feelings are not reduced to variables but are viewed as a whole. The goal of this approach is to come as close to experiencing reality as the individual experiences it. The result is a better understanding of other peoples perspectives. The benefit is data which has not been filtered by operational definitions or rating scales.

Traditional epidemiology takes a positivistic approach in that it seeks the facts or causes uses measurable variables. By concentrating on quantitative measurements the epidemiological model cannot account for the subjective state of the individuals.

The approach used for this paper uses a phenomenological design (Deutscher 1973). The commitment is to understand the social phenomenon from the individuals own perspective. The "comprehension of phenomena...[can] be brought about only by the development of a sympathetic understanding of the holistic picture"² Reality is cannot always be described by statistics. Reality is what the subjects perceive it to be.

The traditional approach in epidemiology relies on data collection which is then subjected to various statistical methods. This study relies on in-depth interviewing to achieve verstehen (Weber 1968). Verstehen is an understanding of the

². John R. Gold. An Introduction to Behaviourial Geography, Oxford University Press, New York, 1980. p.11.

motives and beliefs behind peoples perceptions and actions by interacting at their level.

The sample used was comprised of fifteen individuals who are involved in health care. The informants were comprised of doctors, nurses, x-ray technicians, radiation therapists, oncologist, medical physicians, dentists, and dental hygienists. In order to gain a further understanding of what the work environment is like for some of these individuals, the author of this paper toured a radiation therapy clinic. The criteria for selection was based on health care workers who are regularly exposed to ionizing radiation as part of their occupation.

Due to the covert nature of the research, the method used to gain access to the sample is known as snowball sampling. The research had to be covert because the administration of these institutes was reluctant to allow the author admittance. In order to gain access to informants snowball sampling had to be employed. Quite often one informant would introduce another subject for interviewing. In many cases the interviews were done over the telephone to assure the anonymity of the informant and because the informant health care practitioners were very busy. Unfortunately, this meant many of the interviews were limited to a time of 15-30 minutes. The informants were randomly selective and there was no prior knowledge of the informants to ensure objectivity.

V. Risk Perception Model

What is the process that individuals undergo when they work in an environment where they are daily exposed to ionizing radiation? The model of risk perception was designed to show the process the author found health care professionals experienced in order to cope with this daily risk. Figure 2 illustrates the author's own model of risk perception.

Risk, at any level, does not really exist to the individual until s/he perceives there to be one. One respondent stated, "There is a psychological recognition of the reality of it. I know I'm getting exposed. I know, I have been exposed." This subject recognized that the workplace offered some risk to ones health; "I think...well I know it causes mutated cells that can result in cancer."

Once the risk was perceived, people go through some degree of uncertainty. Uncertainty was created by two factors. The ambiguity of scientific information and the invisible nature of the radiation.

Firstly, science provides information which supports and denies that low levels of ionizing radiation has any effect on individuals health. This ambiguity lessens the individuals feeling that they have control over their situation. Secondly, ionizing radiation cannot be detected by any of the senses. This also contributes to the ambiguity of whether or not one is being exposed to unsafe levels of radiation. This left one individual in a stressful situation: "As long as I can control it then I don't worry. It's if I can't control the level that causes me to worry."

Model of Risk Perception

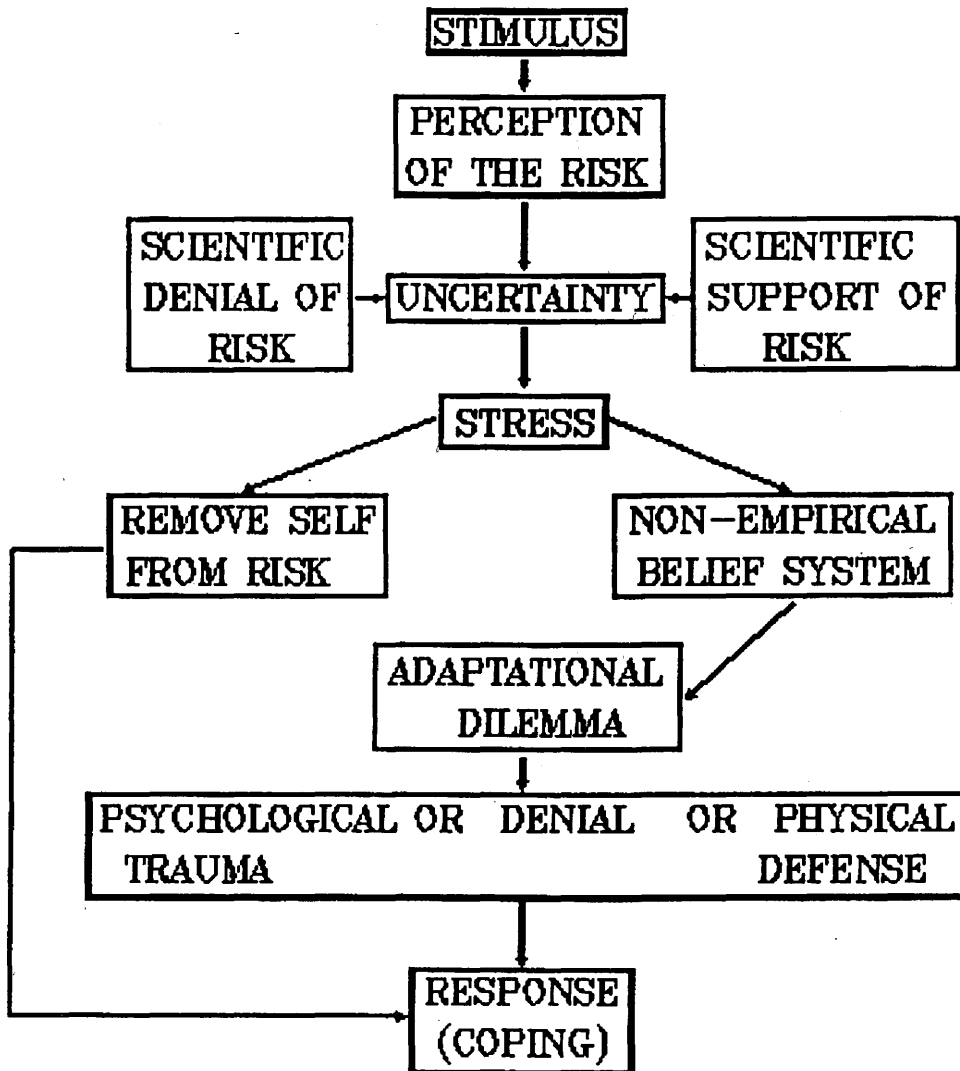


Figure 2. This flow chart was created by the author to describe the process of risk perception from the stimulus to the response stage.

Irving Janis developed the conflict theory model of decision making.³ Janis recognized that stress does not always have detrimental effects. Stress can provide individuals with the incentive to seek information and initiate personal appraisals. Stress can also cause individuals to feel they could never cope with the situation and therefore must remove themselves from the threat. This was the case for one x-ray student who felt that she was endangering her health too much by continuing her studies. The informants showed how concern about their own safety encouraged them to seek ways to deal with the situation in order to be able to do their jobs.

Non-empirical appraisal of health threats are common to risk perception. They are not due to ignorance or naivety and in some cases were based on scientific observation. Many of the informants felt that their personal beliefs were not valid; "I think there is something to be concerned about. But I mean, that's just my opinion."

Non-empirical beliefs are part of a persons appraisal of the risk involved. Symbolic interactionist theory argue that the meanings or beliefs people attach to something like radiation risk is done through this process of interpretation. This interpretation is very individualistic but is influenced by others reactions. Some will see the risk as very great and others will see the risk as not existing at all. It allows the individual to make the best adaptational move for themselves. The goal is to reduce the stress they are experiencing due to the

³. Henry M. Vyner, Invisible Trauma, Lexington Books, USA, 1988. p. 93.

uncertainty of the risk of low dosages of ionizing radiation and develop coping mechanisms.

From this non-empirical belief system there is a stage of cognitive appraisal of the methods in which one can deal with the risk. This appraisal stage defines the individuals course of action towards the perceived risk based on the meaning they have attached to it.

Janis defines different patterns of coping in his conflict theory model. Some people exhibit "unconflicted change" patterns.⁴ These individuals choose to use protective mechanism such as lead aprons and badges which measure how much radiation they are being exposed to "in case there really is some danger". Others will choose to ignore the risk and "worry about the problem later". This is an example of Janis's "unconflicted inertia" coping pattern. These individuals are also likely to experience some level of stress but it was due to their own lack of trust in safety measures.

Some of the workers admitted to experiencing some level of psychological trauma, especially if they are uncertain about the amount of radiation they are receiving. This trauma manifested itself in degrees of anxiety, stress or depression. As one nurse stated; "Sometimes I just get so frustrated. We should'nt be exposed at all...and the patients... I just give up." Although the data needs more research, it appears that those who experienced some level of psychological trauma also smoked cigarettes or drank more than ten drinks a week.

⁴. Vyner, p. 94.

The final stage is the stage in which individuals felt that they were coping with their situation in the best way they could see possible. This is the goal for health care workers because otherwise, they would not be able to work in this environment. The impression of "doing one's best" put the individual in control of themselves again. This control is sufficient to deal with the daily risk. However, if there is a "situation" where one is accidentally over-exposed, the individual goes through the cycle again. It may take a couple of days to regain a way of coping.

VI. Results

A. Risk Perception

The informants showed a remarkable awareness of the risk of radiation exposure: "Ya, I'm aware of the risks. I think well I know it causes mutated cells that can result in cancer." They were unanimous in the fact that a risk does exist, however, some saw it as a relative risk. Many of the informants emphasized that radiation was very dangerous at high levels. "You're aware of the risks and you learn to put it in perspective."

For most of the informants the level of concern was very low; they were rather dismissive of the risk involved. "I don't worry unless my badge readings are above tolerance...whatever that is." "It helps to keep it in perspective. You know radiation isn't just a simple matter of, if you get it, boy you had better watch out or if you don't get it then you are home free. It all depends on the size of the dose."

There was a strong sense of denial because this risk was "part of the job." In order to work as a health care professional, the informants recognized that they technically had to redefine and accept the risks that came with the job. "I didn't weigh out the risks before I went in. I went in and accepted the risks and learned to deal with them." "There is a pre-existing job conception. When you come onto this ward, you are going to have more radiation exposure. That's just a fact."

Getting rid of the risk of radiation exposure would either "mean not using radiation in hospitals" or removing oneself from the hospital setting. Only one x-ray student felt that she could

not deal with the risks. This student saw the personal risks as too great for her. This informant was the only member of the group, who decided to deal with the situation in this way. However, some chose "not to think about it" which suggests that people try to defer the risk.

Members of the study group learned about this risk in different ways. The physicians and nurses studied, did not receive any formal education on the risk of radiation exposure. "In school they were more concerned about the diagnostic use of radiation, not the protection." The only group which was trained in radiation safety as part of their curriculum, was the one which actually operated the radiation producing machines. One radiation therapist stated "we're really well trained to deal with the risk." This they felt, gave them a sense of empowerment over the situation. "Its the education that saves us, we have to have some kind of base."

Other sources of information stated were, monthly journals and the television. "I learned about radiation from the T.V. Especially after that movie...the one about the day after a nuclear explosion." Since for some of the informants "there was no formal documentation done during school" they had to educate themselves on the risks. One informant claimed their motto to be "the less radiation the better."

It was hard for the informants to explain the direct link between ill-health and low-level exposure. This may be due to the ambiguity of literature on the illnesses caused by low-level radiation. "There is not much definitive evidence that is quoted in terms of an excess number of deaths among radiation oncologist

and radiation techs..."

To conclude this section, it must be noted that in order to extract information from the informants, the researcher had to ask them to remove the 'cloak of authority' they used to assist themselves in denying the risk. The cloak of authority, is the mask of competence, that medical professionals use when faced with uncertainty. Once this cloak was recognized by the researcher and asked to be removed, the informants seemed somewhat relieved to say how they felt about the risk of radiation exposure. "Well, as chief of this department, I have to show that I have some control...but if you want to know the truth, I'm really not too sure myself at times."

B. The Occupational Hazard

Radiation exposure is viewed as an occupational hazard. "it can be an occupational hazard in some, because it causes them to fear." The risk of exposure produces different levels of anxiety in different individuals. This stress can have harmful effects on peoples health. "If someone gets very anxious about one incident, what are the chances of them having a heart attack 20 years down the road."

Rarely, do we consider the mental health effects of environmental contaminants on the people exposed. The physical health effects of low-level radiation are difficult to measure, however, the mental health effects are much more immediate and apparent. In order to cope with daily risks, there often were risk trade-offs. Many of the informants smoked cigarettes and one third of them drank more than 10 drinks a week. Stated one informant: "I have smelled the cancer. I work with radiation

and I still smoke. It's a source of continuing amazement to me but I need them."

These methods of coping can be seen as risk trade-offs, because the individual is sacrificing some aspect of their health to deal with a stressful situation. Unfortunately, this is not viewed very understandingly among the health care practitioners. "I have alcoholics here who are putting down two 26'ers a day, they're smoking three packs of cigarettes a day, they've got cancer and they're telling me that they are worried about radiation exposure."

Another aspect of low-level exposure, as being an occupational hazard, happens when "incidents" occur. This is the term used by informants to describe a situation when they are accidentally over-exposed to radiation.

We've had incidents here. Things just don't go according to plan. So you have a radiation worker fully acknowledging the long term chronic exposure. Then something happens and I have the potential of receiving a large dose. Then my predetermined tolerance goes down...and I am very upset despite what I had to cope with before.

As described by the perception model, when an individual experiences an "incident", their previous coping mechanisms are no longer effective. Their perception of risk increases until they have had sufficient time to find a new way of coping with their daily risks. Some of the ways in which they cope is to increase their smoking or their consumption of alcohol.

To these informants this hazard is sometimes apparent in their friends at work. "There are girls here who have been doing

it for thirty years and they have thyroid cancer. One guy got leukaemia. But who knows?" One of the nurses commented on the number of miscarriages among her friends at work. As long as the scientific evidence is inconclusive, these individuals fears are not justified, nor is their ill-health compensated accordingly.

Despite their own risks from radiation exposure, the x-ray technicians and nurses expressed concern for the patients who are being exposed:

The people they're doing it on...God, like they're in the last stages of illness. It's like we're tired of people being treated like guides pigs. There are some doctors I'd like to string up...they do such stupid things for the sake of learning.

These carers expressed great mistrust in the use of radiation, just for experimentation. While they saw radiation as a useful tool, they also felt, it was a tool that was abused too much.

C. Relative Risks

The informants were much more concerned about other occupational risks such as Hepatitis B or AIDS. They saw getting x-rays as much more dangerous as giving them. Many objected to the number of x-rays prescribed by physicians:

The doctors just scatter. They're afraid they're going to get it in the nuts or something...yet they're the ones who order a chest series on a patient who has to be held up. They're afraid, and it's me and the patient who are getting exposed.

The impression the informants gave was, that illnesses like hepatitis B and AIDS are much more readily apparent and therefore

pose a much greater threat. While exposure to HIV does not ensure getting AIDS, there is much better evidence to say that you will. In the case of low-levels of radiation, there is a distancing effect. As long as the effects don't show up in ten or fifteen years, then there is no real reason to worry about it now. "I don't tend to think of it in that kind of long term."

There is also an impression that the exposed have more control over the levels they receive, thus risk is then removed to a much further point in time. If the individuals trust the methods of protection they are using, then they feel they are doing the best they can to protect themselves, and this removes the threat.

Finally, many see the benefits as outweighing the risks. "In my eyes, the good outweighs the bad." Part of nature of risk taking is, that if the benefits surpass the costs, then the risk perception is reduced greatly. However, if the costs surpass the benefits then the perception of risk is greatly increased. Those who saw radiation as useful agreed that the risks were well worth taking. "The risk, when you put them against everything else...I wanted to do it, helping people just does it for me."

VII. Conclusions

Each person had to go through the risk perception process to reach a level where they could cope with the daily threat of exposure. No one else could accomplish this for them. While most workers reached the same point of being able to cope, there were different ways of dealing with the perceived risk. Some, experienced stress or anxiety which could be harmful to their health especially over a long period of time. Others, chose to use physical methods of protecting themselves whether they trusted the reliability of these methods or not. Again, other chose to deny or ignore the threat, because there were other more pressing threats to their safety.

There did seem to be some indication of sex differences in perception. Women seemed to see the risk as much greater than their male counterparts. They expressed greater doubt in the amount of information known on the subject of low-level radiation. This could be linked to the reproductive function of women and the fact that radiation is supposed to cause gene mutation. "I have some doubt. I was really concerned when I was first pregnant. I almost quit." The possible risk that radiation could threaten their fertility, was very threatening to women. Much more research is needed in this area to determine if this is conclusive.

The study done by the United Nations Environment Programme (1985) on the "Acceptability of Risks" showed that women perceived nuclear power and x-rays to be much more threatening than did the businessmen they compared them with. Figure 3 illustrates the findings of this study. Using a scale of 1 to

Risks - Perceived And Real

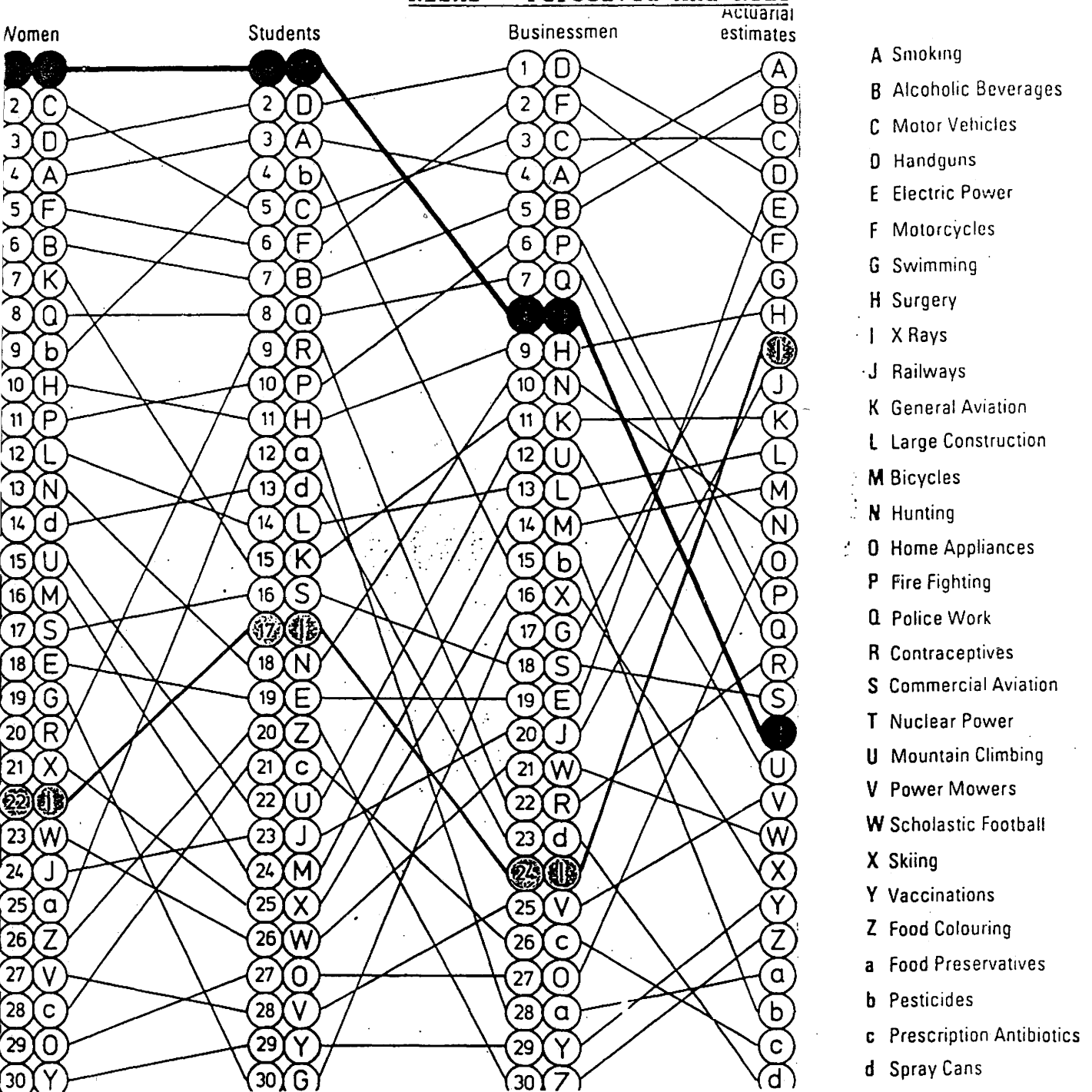


Figure 3. This chart illustrates the results of a study done on perceived environmental risks among women, students, and businessmen.

Source: United Nations Environment Programme. "Acceptability of Risks", Radiation Doses, Effects and Risks, 1985.

30, women ranked the risk from nuclear power to be number one. The comparison group of businessmen ranked the same risk as number 8. The actual risk is ranked at 20.

Another area, which requires further research is the differences of risk perception among those who work in diagnostic radiation, and those in therapeutic radiation. Figure 4 shows the different uses of radiation under the distinction of diagnostic and therapeutic radiation. This study indicated that each group perceived the other to be taking much greater risks than they themselves were. In fact, there was some indications that the diagnostic radiation workers were much less concerned about the risks, and were more likely to be casual about it. However, there were more incidents of accidental over-exposure amongst those in therapeutic radiation.

Traditional epidemiological approaches fail to account for the mental processes and illnesses caused by health risks. By concentrating too much on morbidity and mortality data, we come to no further understanding of how people perceive a risk, why they perceive it as a risk, and how they cope with the risk. Numerical values cannot reflect all the day to day realities of these individuals.

This study has taken a qualitative approach to the study of Occupational health risks. We have shown the importance of symbolic interactionist theory in understanding the process of perception and behaviour. As Sjoberg (1987) found, this study has proven that, when the risk is perceived to be worth taking, individuals will take it. The conclusion of this study shows that behaviour is mediated by the perceptual process as Gestalt

Medical Uses of Radiation

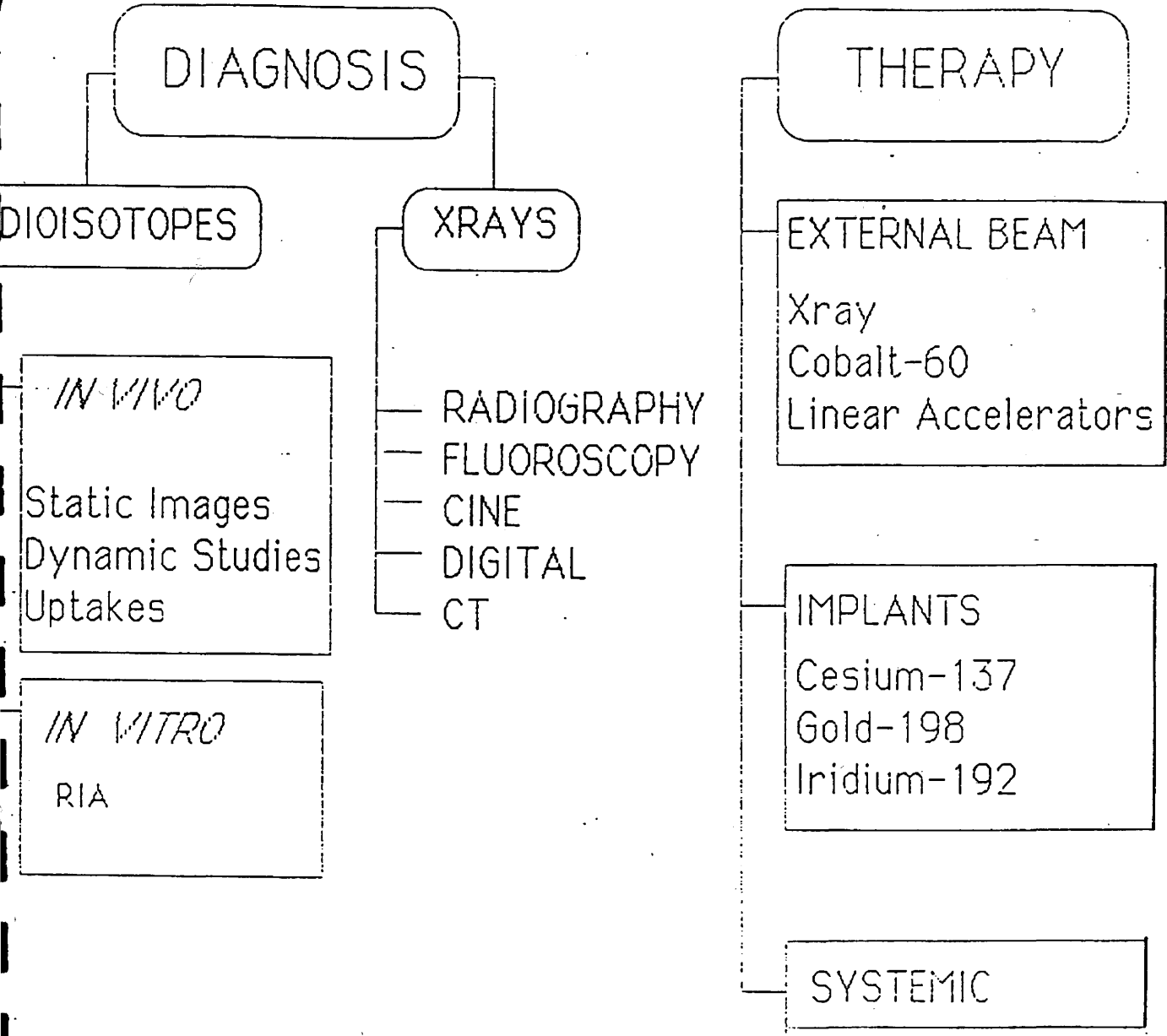


Figure 4. This diagram illustrates the division in the use of ionizing radiation for health care. Radiation can be used for diagnostic or therapeutic purposes.

Source: Dr. J. Aldrich, "Medical Applications" Seminar on Radiation Protection, Halifax, 1988.

theory indicates. We have found that while the risk of low level exposure to radiation is accepted, personal perceptions are what affects the health care practitioners behaviour.

The personal accounts indicated, that low-level radiation exposure is a concern which is not being taken too seriously by policy makers. The issue of responsibility when working in a risky environment is a controversial one that is becoming important as policies or health promotion have reached government levels. The question is, should occupational health policy be more collectivist or individualistic? Most of the informants saw the policy as being individualistic; the responsibility for protecting themselves was ultimately their own.

We understand how people react to a situation where the health threat is considerably less. By having this information, we can design an occupational health system and health policies, that are appropriate to the lay perceptions of risks to their health. Models of how to deal with serious accidents, can be developed. The goal should be to deal with the issue of concern as an occupational health problem and not to ignore it due to a lack of good evidence.

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