

1993-01

THE SOURCE OF RADON RISK PERCEPTIONS
FOR RADON PROFESSIONALS AND THE GENERAL PUBLIC.

by: Raymond H. Johnson, Jr. , C.H.P., P.E.
Key Technology, Inc.
P.O. Box 562
Jonestown, PA 17038

ABSTRACT

Attempts to encourage homeowners to test their homes for radon over the last 8 years have disclosed both resistance and apathy to the potential health risks of radon. Professional health physicists have also indicated widely differing views on the significance of radon as a health risk. Some of these divergent views on radon risks can be understood in terms of the different approaches used by health professionals and the general public to gather radon risk information and to make risk decisions. The different approaches were assessed by the Myers-Briggs Type Indicator. This is an instrument that measures preferences for 1) gathering data using our five senses (Sensing) or using an intuitive approach (Intuition), and 2) making decisions using logical analyses (Thinking) or empathy and values (Feeling). Each person has a hierarchy of these four preferences from No. 1, which is most used and most skillful, to No. 4, which is never used and is therefore unskilled. For the general public the No. 1 preference is Sensing followed closely by Feeling. Thus, No. 3 and No. 4 for the public include Intuition and Thinking.

Preference No. 4 is the inferior function and the source of risk perceptions. For example, for many members of the public preference No. 4 is Intuition. These people worry about imagined consequences of radon exposures. Their perception is clouded by fearful visions, persecution ideas, and sinister premonitions of illness and misfortunes. Those with Thinking as the No. 4 preference often develop cynical negative thoughts of illness, death, and tragedy. They are also easily overwhelmed with detail and prefer to adopt someone else's thinking about radon risks. They often impose these thoughts on any further facts that they receive. For radiation professionals, the 4th preference is often Feeling. For them, Thinking values dominate and they do not express their feelings. Their Feeling decision making approach is undeveloped, barbaric, fanatic, and childish. Feelings are overwhelming and they are prone to black and white judgements about risks. For other professionals, the 4th preference is for Sensing. They tend to be vague with facts, not very observant, and prone to make errors of deduction when making risk assessments. Persons with concerns for a balanced approach to radon risk communication can easily learn to distinguish the four preferences. An understanding of these preferences as a source of radon risk perceptions will allow risk communicators to present radon risks in ways that encourage informed decisions rather than gut reactions arising out of perceptions.

* Ray Johnson is also Director, Communication Sciences Institute, 3827 Farragut Avenue, Kensington, MD 20895

INTRODUCTION

Since the public began hearing about radon health risks in the news in 1985 - 1986, less than 10 % of the estimated 80 million homes in the United States have been tested for radon. Despite significant efforts by the U.S. Environmental Protection Agency, state health programs, organizations such as the American Lung Association, and the radon industry, more than 70 million homes remain untested. A large proportion of the homes tested for radon were the result of the joint news release by EPA and the Surgeon General of the U.S. Public Health Service in October 1988 announcing that indoor radon leads to 20,000 lung cancer deaths a year in the United States. Many homeowners, reacting out of fear for this new and alarming source of risk in homes, rushed to get their homes tested in late 1988 and early 1989. Since then, however, the best attempts of health professionals to encourage homeowners to test their homes have met with resistance and apathy to the potential health risks of radon.

There are many reasons for the lack of public response since the initial scare reactions of 1988 (Johnson 1991). These include:

1. Lack of radon information. Many people still do not know about radon.
2. Lack of understanding of radon risks. Radon is not obvious because it is not detectable by any of our five senses. Out of sight means out of mind.
3. No one knows of a single person whose lung cancer is due primarily to radon.
4. Homeowners have concerns about radon measurements and mitigation because they do not want to be ripped-off.
5. Homeowners are stubborn. They do not like to be told what to do, especially in their own homes,

In addition, homeowners are hearing about debates among health professionals concerning whether radon really represents a significant health risk. Some health physicists question the radon risks publicized by the EPA. They believe the risks are overstated. Many believe that radon is a part of natural background radiation to which mankind has adapted and our efforts to reduce radiation risks should be devoted mainly to man-made sources of radiation that add to the natural background. Others look at the average radiation dose attributed to radon (about 200 mrem/year at 1.3 pCi/L), and conclude that radon is the most significant of all sources of radiation risks. These differences in views among health professionals and the general public lead to a range of reactions to radon risks.

REACTIONS TO RADON RISKS

Health professionals and the general public alike have responded to radon health risks with a range of reactions shown in Figure 1. The dramatic response to the radon message from EPA and the Surgeon General in the fall of 1988 was largely a fear reaction from people worried about radon risks to themselves or their families. About 2 million people tested their homes within 6 months of that message. By the middle of 1989, however, the

SOURCE OF DIFFERING VIEWS

The different reactions to the radon message can be partly understood in terms of the different approaches used by health professionals and the general public to gather radon risk information and to make decisions. We can assess these differences with a popular instrument called the Myers-Briggs Type Indicator (MBTI) (Myers, et al. 1980). The MBTI identifies preferences in four areas that are basic to everyone's personality. This paper will focus on only two of these areas, namely the preferences for data gathering and decision making.

According to the insights of Dr. Carl Jung, everyone gathers data by one of two opposite preferences which he called **Sensing (S)** and **Intuition (N)** (Myers, et al. 1985). Key words defining these two preferences and the percentage for each in the U.S. population are as follows:

S - 70%

Five senses
Actual
Reality
Practical
Specific
Details
Present

N - 30%

Hunches
Possible
Concepts
Imaginative
Abstract
Patterns
Future

Sensing types like to gather information through their five senses for specific, detailed, measurable, factual, concrete data. For them the real world is primarily what they see, touch, taste, smell, or hear. Since 70 % of the general population prefers Sensing, we can begin to appreciate the difficulty in communicating radon risks to the public when radon is not tangible to any of their five senses. Intuitives, on the other hand, prefer to see patterns, relations, and probabilities. They tend to have less difficulty with "concepts" of radiation risks. They are more comfortable in the world of abstract theories and models. They tend to see the forest rather than the trees and to read between the lines.

These two types often see each other in negative ways. Sensing types see Intuitives as having their heads in the clouds, as dreamers, vague, impractical, and careless with details. Sensing types are seen as stuck in the mud, having no imagination, picky with details, and slow to grasp concepts. However, both preferences are equally valid and important ways for gathering data. It is helpful to have Sensing types provide the practical specifics as well as for Intuitives to provide insights into the broad connections and possibilities. Actually, most people use both preferences often but will rely on only one when perceiving a risk to something /someone they value.

Dr. Jung says we are in a constant cycle of gathering information and making decisions. He defines two opposite preferences for making decisions, **Thinking (T) and Feeling (F)**. The descriptive words and percentages for these preferences are shown below:

Thinking - 50%

Logical
Analytical
Principles
Laws
Cool
Justice
Firmness
Truth

Feeling - 50%

Personal
Empathic
Values
Circumstances
Caring
Mercy
Persuasion
Goodness

Isabel Myers (Myers, et al. 1980) emphasizes that these preferences represent two ways for making decisions. They are not a measure of your ability to think or feel, but rather which process do you favor for drawing conclusions, especially for risk decisions. Thinking types prefer to use logical analysis based on scientific principles and laws. They tend to ask questions about "why" or "how" the world works. For them, truth is the determining factor for important risk decisions, even when it hurts. In contrast, Feeling types base their decisions on sentiments and a hierarchy of values. They are usually more concerned for the well-being of people than the absolute scientific truth. They tend to ask questions about "who" before making decisions. For them, what is good for the people involved takes precedence over all else.

These two types also see each other in negative ways. In fact, the difference in these preferences may be the source of greatest difficulty in communicating radon risks. For example, Feeling types are often perceived as sentimental, irrational, or illogical because they cannot logically defend value based decisions to the satisfaction of the analytical Thinking types. On the other hand, Thinking types are often viewed as cold, calculating, and uncaring. Actually the best risk decisions will make use of both preferences. It is helpful to have the logical analysis of the Thinking types balanced by the people oriented values of the Feeling types. Everyone uses both preferences, but will rely on only one when making an important decision, especially one involving risks to themselves.

Over 1200 radiation health professionals (mostly members of the Health Physics Society - HPS) have participated with the author in a study with the Myers Briggs Type Indicator since 1983. A summary of their measured preferences is shown below in comparison with data for the general public.

These data show that radiation health professionals have an overwhelming preference for logical Thinking decision making, supported by Intuitive data gathering processes. Both

Feeling and Sensing are minor preferences in this group. In contrast, most of the general public prefers Sensing data gathering supported by either Feeling or Thinking decisions. For most of the public, Intuition is a minor preference.

Preference - %

	<u>HPS</u>	<u>Public</u>
Thinking	60	25
Intuition	25	10
Feeling	8	25
Sensing	7	40

COMMUNICATION STYLES

The four MBTI preferences described above also represent the preferred ways, styles, or languages which we use for communication (Johnson 1990). Those who prefer a judging, organized, and decisive life-style will communicate in either the Thinking or the Feeling language. Those who prefer a more spontaneous, flexible, perceiving life-style will communicate in either the Sensing or the Intuitive language. Each of these preferences represents a different language for communication that is as different as the differences in languages between different countries or cultures. Communication will likely be more successful when both persons are speaking the same language. Conversely, communications fail when attempted with different languages. The subtlety in the U.S. is that all four languages use the same English words.

The order of language preference for radiation health professionals and the general public is shown below.

Order of Preference

	1	2	3	4
HPS	T	N	F	S
Public	S	F	T	N

The significance of this order is that No. 1 is most commonly used by people for their entire lifetime. This is your primary language and is as skillful and natural as using your right hand (if you are right handed). Language No.2 is a supporting language which most people begin developing and using since their teens. Thus, this language is also probably comfortable and natural. Difficulties begin in communication when we are confronted by language No. 3. This language is seldom used and therefore it is uncomfortable and unsure. Breakdowns in communication are virtually certain when someone tries to communicate in

the language No. 4. This is the language which people will try to avoid their whole lifetimes. Therefore it is awkward, unskilled, poorly developed, and guaranteed to be misunderstood.

The order of preference shown above dramatizes the differences in languages preferred by radiation health professionals in comparison with the general public. In particular the No. 1 & 2 language preferences for health professionals, Thinking and Intuition, are the No. 3 & 4 preferences for the public. This means that when radiation professionals are using their most comfortable and skillful languages, they are communicating with the public in their most awkward, uncomfortable, and least understood language. Conversely, the public would prefer to communicate mainly in the languages of Sensing or Feeling, and these are the languages for which radiation professionals are most unskilled, poorly developed, and uncomfortable.

INFERIOR FUNCTIONS

The No. 3 and No. 4 preferences are described by Dr. Jung as inferior functions (von Franz 1971). They are inferior, in comparison with preferences No. 1 and No. 2, because they are the least developed, immature, barbaric, emotional, fanatic, impulsive, uncontrolled, uncomfortable, unreliable, slow, and awkward. To help gain a sense of these descriptive terms for the inferior function, you are invited to try the following exercise. Switch your pen to the hand opposite the one you normally use, and quickly write out your name and address. If you take a few moments to do this exercise right now, the following discussion will have much more meaning for you.

Most people report after this exercise that they felt very awkward, uncomfortable, foolish, and slow, not just physically slow but mentally slow because they had to stop and think about each letter of their name. People usually ask, should they print or write in cursive, should they use upper and lower case, or block capitals? None of these questions would likely occur if you were simply asked to sign your name. Because writing with the opposite hand is so unusual (abnormal), so awkward, and so unfamiliar, people generally do not know quite what to do and will experience a fair amount of frustration. They may conclude abruptly that this is a "stupid" exercise. Some of you also realize that if you were willing to commit the energy to practice writing with the opposite hand, and you had adequate time to think about it, you could eventually develop some skill.

When you try to communicate with someone on their No. 3 or No. 4 language preferences, you are essentially asking them to communicate with their opposite hand, i.e. in a language with which they are not familiar, have little practice, very little confidence, and prone to make mistakes. When confronted with these unfamiliar languages, especially in stressful situations, people will revert to a primal instinct for fight or flight for survival. Their response from their inferior functions, i.e. No. 3 or No. 4, will come out unbidden in a crisis and will often be confused, unsure, easily influenced by circumstances, emotional, touchy, and typically of a cynical negative quality.

An acquaintance recently described his reaction in a situation that hooked a response from his inferior Feeling function. He was confronted by his wife of 8 years who heatedly expressed her displeasure, using her primary Feeling language. She was angry and shouted, *"I want you to leave the house, and I want a divorce!"* Although normally a calm Thinking type, he was immediately hooked at the Feeling level and found himself unable to respond in his usual rational way. Feeling the pain and his own anger, and not knowing what to do, he rushed out of the house, jumped in his van, and spun the wheels through the parking lot. Realizing he was driving recklessly, but still caught in his inferior Feeling function, he pulled his van over to the side of the road and slammed his fist into the windshield, breaking both the windshield and his hand. Later, recounting the incident in his normal Thinking language, he could offer no explanation for his barbaric, immature, and emotional behavior.

The inferior function commonly surfaces when we are confronted suddenly in an unfamiliar language and under stress. Unexpected confrontations can often hook our fears, and we feel threatened and vulnerable.. The young man above was suddenly confronted with prospects of losing his wife, his three children, his house, and his whole future. For an instant he saw the end of his world. As soon as his fears were hooked, he no longer knew how to respond in any sure rational manner. Not knowing what to do, he reverted to a basic instinct to flee the source of his fears. It is interesting to note, however, that while his unchecked fears raged inside, he still was rational enough not to do anything to harm others, only himself.

Role of the Inferior Function in Radon Risk Communications

As we saw earlier, health professionals prefer to communicate in the Thinking and Intuitive languages, but these languages are No. 3 and No. 4 for most of the general public. This means the public generally will dislike having to figure out or think through difficult logical analyses. For example, a homeowner with 10 pCi/L of radon in their home will often ask, "Is this safe?" They would like a "yes" or "no" answer in response to their concerns for their family's health. A conscientious health physicist might reply that, "According to the linear non-threshold theory of radon health risk and the observed lung cancer incidence in underground uranium miners, a person exposed to 10 pCi/L of radon 18 hours a day for 70 years would have a risk of about 4 in a 1,000, if they have never smoked, or about 71 in 1,000 if they are smokers."

The average Feeling type homeowner will not judge this technical answer as helpful. They will be frustrated and feel overwhelmed with the details trying to Think through a decision based on radon risk statistics and may well conclude that anything above 4 pCi/L is dangerous because that is what they heard from a news reporter on TV. Consequently, they may impose those thoughts on any further information presented and immediately ask about radon mitigation. Underneath they have dark thoughts of illness, death, and tragedy, They may see themselves or a family member (a child) dying a slow agonizing death from lung cancer.

Conversely, many homeowners are hearing that radon is not really as bad as projected by EPA. They are quick to adopt that thought or idea, because it fits their perceptions of radon which is not evident in their homes. When Feeling types adopt such Thinking judgements, to simplify needs to do any Thinking on their own, they are unlikely to change their minds by even the best efforts of health professionals to logically persuade them otherwise. In fact, they are likely to be suspicious of the motives of anyone attempting to persuade them by logical argument.

The Sensing public also has difficulty with the Intuitive language of science. For example, radon risk statistics present an Intuitive source of insight that has meaning to scientists, but not much to average homeowners. Risk itself is an intuitive concept, especially when presented in terms of probabilities. The general public wants information that clearly specifies "safe or unsafe." When they are confronted with risk probabilities, like 4 in 1,000, they are forced to imagine the likely consequences to themselves as individuals. When forced to use their inferior Intuitive function, they are likely to imagine the worst consequences. Namely, no matter that the statistics say their risk is 1 in a million, or 1 in 100 million, they will see themselves as "the one." Because Intuition is an unfamiliar process, when confronted with the Intuitive language, many people will have sinister premonitions of illness, misfortunes, and fearful visions of radon risks.

For most radon professionals, the language of greatest difficulty is the language of Feeling. Their normal Thinking process dominates and Feelings are a strange, unfamiliar, foreign, and inferior language. When they hear the Feeling language, they are uncomfortable, frustrated, annoyed, and may become angry themselves. Feelings may seem overwhelming as illustrated with the young man above. When a Thinking person's Feelings are hooked, he/she may make impromptu black and white, love and hate, decisions. They may be easily misled and either over, or under, react to the circumstances. A person who does not normally deal with Feelings, when Feelings are finally aroused, may explode in reaction to a small incident way out of proportion to the actual event.

How are Feelings hooked for radon professionals? We saw examples of this in 1989 and 1990. The EPA and the Ad Council developed a public service announcement showing members of a family zapped one-by-one into X-ray skeletons as a voice-over narrates the dangers of radon. Health physicists and radon professionals decried this approach as "scare tactics," which they labelled as unprofessional and unethical. Scientists believe homeowners should be persuaded to test their homes for radon by logical analysis (Thinking) rather than appealing to their common fears about radiation. Radon professionals were also upset when EPA proposed to revise the *"Citizens Guide to Radon"* (EPA 1986) and replace it with a document drawing heavily upon the Feeling language. The title of the proposed guide was, *"Don't Let a Dangerous Intruder Invade Your Home."* The guide presented radon as an invisible "deadly" intruder that cannot be kept out by locking doors and windows and it kills thousands of people each year.

Because the Feeling language is so unfamiliar and unnatural for radon scientists, when they are confronted in this language they quickly react from their own fears to try to change the language back to their familiar and trusted Thinking language. They do not recognize that at least half of the world primarily speaks the Feeling language. By insisting on the Thinking language alone, they are missing an opportunity to communicate effectively with a large proportion of the public.

Radon professionals who commonly rely on the Intuitive language will also have great difficulty with the Sensing language. When speaking their normal Intuitive language, they are often vague with facts. They do not realize they are being vague, but that is how they are viewed by many homeowners. Intuitive scientists are also not very observant and will often continue to present radon risk concepts even when it should be obvious that the homeowner has no idea what they are saying. Some of these scientists may also overlook details in drawing conclusions. For example, they may conclude that people who cannot understand risk statistics are slow thinking and lacking in intelligence. They may not conclude that failure to communicate effectively is their responsibility and the result of speaking the language of Intuition in a world that primarily speaks Sensing. When Intuitives are confronted with demands for specifics in the Sensing language, they may give impromptu conclusions based on their Intuitive perceptions without considering all of the facts. This was also a factor in the response of scientists to the "scare tactics" of EPA. Intuitively, scientists believe that Thinking and Intuition are the only valid languages and erroneously conclude that all other languages are invalid and should be avoided.

EFFECTIVE RADON RISK COMMUNICATION

Since four languages are in common use in the United States, radon risk communication will be most effective using a balanced approach that combines the positive features of each language. As noted, most of the general public prefers to communicate in either the Sensing or Feeling languages. This means they want to hear a radon message that they can relate to in their own experience, i.e., in analogies with what they know. They want information that is specific, factual, concrete, practical, sensible, and real in the tangible world of their five senses. They do not want to hear abstract concepts, theories, models, statistics, or hypothetical risk estimates. They want to deal with the present moment and what makes sense right now.

Those who prefer the feeling language want to hear communication that addresses their personal values, that demonstrates caring, hears feelings, and expresses compassion for their needs, both physical and mental. They want to be appreciated for their own concerns and look for answers that are good for everyone involved. They do not want to hear criticism, or logical, analytical, arguments, or complicated analyses. They look for affirmation and harmony.

When Sensing and Feeling types do not hear answers to their questions in their own languages, they become suspicious and their suspicions arise naturally out of their inferior Thinking and Intuitive functions. Radon professionals who use these languages are seen as insensitive, not in touch with the real world, or worse, as hiding or covering up something. Since technical experts in the radon industry and in government are primarily Thinking and Intuitive types, the general public is easily led to mistrust them, no matter what they say or how well they may have public interests at heart.

To be more effective, radon risk communicators can learn to distinguish the four languages and observe the order of preference. For example, if someone is observed to prefer the Feeling language, then it is safe to assume that Thinking will be an inferior function. From such an observation, you can then decide to communicate primarily in the preferred Feeling language. This approach would minimize miscommunication arising out of use of a foreign language which requires others to constantly translate into their language and frame of reference.

Above all else, however, we should strive to avoid appeals to inferior functions. Communication on the wavelength of language No. 4 is guaranteed to be unsuccessful every time. Language No. 4 is unskilled, inexperienced, suspicious, awkward, slow, and uncomfortable. Most people will do whatever they have to do to avoid communication in their own language No. 4. When someone else insists on using that language, they will have no credibility. Even worse, they may be viewed as an opponent attempting to commit harm rather than good.

The bottom line is, if you want your audience to hear your message, use their preferred language. Conversely, if your audience is not getting your message, be aware that you may not be speaking their language and be prepared to convert accordingly. For effective communications, you need to present your message in the preferred language of your audience, no matter what your own preferred language may be. To translate your message into another language will require effort on your part. It will also require training and practice.

SUMMARY AND CONCLUSIONS

Many homeowners rushed to test their homes for radon in 1988 - 89 out of fears aroused by widespread press coverage of EPA's announcement that indoor radon causes about 20,000 lung cancer deaths a year in the United States. Since then the initial fear reaction has waned and over 90% of the homes in the U.S. remain are still untested. Most of the public is apathetic towards radon and considers other needs or risks of living as more important. Many are in a resistance mode because they do not want anyone telling them what to do in the privacy of their own homes. Some health physicists believe that EPA's radon risk estimates are overstated. Other radiation professionals believe that radon is the most significant of all sources of radiation and warrants the highest priority attention.

Widely differing views on radon health risks, and on programs to deal with radon, among radon (radiation) professionals and members of the general public, can be partially understood in terms of differences in preferred ways of gathering information and making decisions as measured by the Myers-Briggs Type Indicator. Scientists prefer to gather information by Intuition (patterns, concepts, theories) and to make decisions by Thinking (logical analysis to determine scientific truth). The general public prefers to gather information by Sensing (five senses, specific, factual data) and to make decisions by Feeling (personal values, circumstances, caring).

The differences between radiation professionals and the public for data gathering and decision making also reflect their preferred languages for normal communication. Scientists prefer to speak in the languages of Thinking and Intuition, whereas much of the public prefers the languages of Sensing and Feeling. Each of these languages represent differences in culture, lifestyle, perspectives, etc., which are as great as differences between language and cultures of different countries. Unfortunately, the differences are not immediately obvious because each of these languages use English words.

Each person has a hierarchy for preference of each of the four languages. No. 1 and No. 2 language preferences are likely to be skillful, comfortable, sure, trustworthy, and reliable. In contrast, the No.3 and No. 4 language preferences are likely to be uncomfortable, unskilled, immature, impulsive, slow, and awkward. These languages are called inferior functions by Dr. Carl Jung and they represent the source of risk perceptions, bias, and prejudice. People usually try to avoid communications in their inferior languages, therefore, these languages are unpracticed and unfamiliar. People will not have confidence in these languages and are prone to make mistakes. When confronted with these unfamiliar languages people are suspicious, touchy, emotional, and inclined towards cynical negative reactions.

Since the general public prefers Sensing and Feeling, Thinking and Intuition represent their inferior functions. Consequently, when radon professionals speak in their preferred languages of Thinking and Intuition, the public does not understand them, and even worse, may see radon professionals as opponents not having the public's interests in mind. Because the public wants to avoid the complexities of the Thinking/Intuitive process for radon risk assessment, they are prone to adopt the simplified thinking of the news media or other trustworthy (Sensing /Feeling) source. If the source says radon is "deadly," they may react in haste to test and mitigate their homes. If the source says radon is overstated, they may adopt that conclusion because it fits with their own sensory data, which sees no direct evidence for the presence of radon or radon risks.

Scientists in turn react adversely to attempts to persuade the public in the language of Feeling (their inferior function) because they see this as "scare tactics" and contrary to good science. Consequently, scientists are distrustful, biased, and prejudiced against programs that use the Sensing/Feeling approach to public communication. Many scientists conclude that Thinking/Intuition are the only rational languages for communication of radon risks and if the

public is not getting the message then the public is at fault. Homeowners have been warned of the dangers of radon and the decision is up to them.

Since the inferior functions represent the source of risk perceptions and adversity in risk communications, every effort should be made to minimize appeals to those functions or languages. The most effective radon risk communication will take into account that four English languages are commonly used in the United States. A balanced approach that combines the positive qualities of each language will have the best likelihood of success for all persons concerned with radon risks. Radon risk communicators can learn to distinguish the four languages and to communicate in those languages that will be most effective. In particular, more of the public is likely to hear the radon message if it is presented in the languages of Sensing and Feeling. Learning these languages may not be easy for radon or radiation health professionals, but it can be accomplished with training and practice. This may be our best hope for improving communications on radon health risks. An understanding of language preferences as a source of radon risk

REFERENCES

- Johnson, R. Communications - The Health Physicist's Dilemma. Transcript of a verbal presentation at the Annual Meeting of the Health Physics Society, Baltimore, MD, June 22, 1983.
- Johnson, R. and Petcovic, L. Communication Styles of Radiation Professionals. In: Risks - Perceptions, Management, and Communication, proceedings of the Midyear Meeting of the Health Physics Society, Atlantic City, NJ February 4 - 8, 1990.
- Johnson, R. Motivating Homeowners to Test and Mitigate for Radon. In: Radon Today: Unifying Federal, State, and Private Sector Initiatives, proceedings of the Fifth Annual Radon Conference, Rockville, MD October 9 - 12, 1991.
- Johnson, .R., Morgan, J., and Petcovic, L. A Practical Guide to Radiation Health Risk Communication. Communication Sciences Institute, Rockville, MD (In Press - 1993).
- Myers, I. and McCaulley, M. Manual: A Guide to the Development and Use of the Myers-Briggs Type Indicator. Consulting Psychologists Press. Palo Alto, CA 1985.
- Myers, I. and Myers, P. B. Gifts Differing. Consulting Psychologists Press, Palo Alto, CA 1980.
- U.S. Environmental Protection Agency. A Citizens Guide To Radon. Washington, DC. 1986
- von Franz, M. and Hillman, J. Jung's Typology, Spring Publications, Inc. Dallas, TX 1971.