The Neurobiology of Impulsive Sensation Seeking
Genetics, Brain Physiology, Biochemistry, and Neurology

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TRAIT DEFINITION

I was originally asked to write this chapter on the “Neurobiology of Personality,” but on reflection realized that this was too broad a topic to be covered in a short chapter. I therefore decided to focus on a specific personality trait which I have studied for about 40 years. Those interested in the broader field of the “Psychobiology of Personality” may consult my book on this subject (Zuckerman, 1991) or my chapter in the recently published Handbook of Psychology (Zuckerman, 2003). Another volume devoted to sensation seeking and its “behavioral correlates and biosocial bases” can be consulted for a more extensive exposition on the trait (Zuckerman, 1994). The definition of sensation seeking in this book is:

“...a trait defined by the seeking of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experience” (p. 27).

It must be emphasized that risk per se is not the goal of sensation seeking, although it may enhance the arousal produced by the sensations themselves. Impulsive sensation seekers hardly consider the risks, but more planful ones evaluate them and do what they can to reduce them. Low sensation seekers simply do not
see the point in taking any risks that are unnecessary and they tend to overestimate risk, as highs underestimate it (Horvath & Zuckerman, 1993; Zuckerman, 1979).

Other investigators have used terms like “novelty seeking,” “thrill-seeking,” “monotony avoidance,” and “venturesomeness” to describe this trait, but these are unsatisfactory in that they only describe part of the broader concept, including what qualities of sensation are sought (intensity and complexity as well as novelty) and what forms of expression are found. Factor analyses of the extended scale items revealed four forms of expression which were translated into subscales in forms IV and V of the Sensation Seeking Scale (SSS) (Zuckerman, 1971; Zuckerman, Eysenck, & Eysenck, 1978):

1. **Thrill and Adventure Seeking** (TAS): expressed in a desire to try risky but exciting physical activities like sky diving, scuba diving, hang-gliding etc.
2. **Experience Seeking** (ES) or the seeking of excitement through travel, art, music, and leading an unconventional life-style with like-minded friends.
3. **Disinhibition** (Dis) a social expression, seeking excitement through social drinking, drugs, parties, and sexual activities with a variety of partners.
4. **Boredom Susceptibility** (BS) is an aversion to lack of variety in stimulation or friends and restlessness when there is a lack of variation and change.

A total score based on all four factors is used in form V as contrasted with a General scale in form IV of the SSS. More recently, based on the factor analyses of scales and items, we developed a scale combining impulsivity and sensation seeking items called “Impulsive Sensation Seeking” (Zuckerman, 2002; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993).

**PSYCHOBIOLOGY**

The reliability and construct validity of scales used to measure sensation seeking and the many kinds of phenomena associated with the trait are described in previous books (Zuckerman, 1979; 1994). This chapter will focus on the biological correlates. My approach is a top-down one, from traits to genes with all levels between (Zuckerman, 1993), However, I have drawn rather extensively from studies of exploration and novelty seeking in other species in a comparative approach (Zuckerman, 1984). In this chapter I will describe studies which link behavioral expressions of sensation seeking in humans and other species using a common psychophysiological index found in both. I will begin, however, with the area that links the top (traits) with the bottom (genetics) in the science of human behavior genetics.