

Summary

Sensory Processing Sensitivity: Theoretical Framework and Literature Review

Gülbin Şengül-İnal

Middle East Technical University

Nebi Sümer

Sabancı University

This paper systematically reviews the previous studies addressing sensory processing sensitivity (SPS). People perceive and interpret stimuli in their social and physical environment and show appropriate (compatible) responses to these stimuli. However, those who experience deep sensory processing strategies differ significantly in perceiving, interpreting and responding to the sensory information in the environment. Sensory processing sensitivity, which was coined by Aron and Aron (1997), defines this fundamental difference in experiencing and expressing sensory information as well as employing different sensory processing strategies. Considering that there is a shortage of studies on SPS in the Turkish psychology, we aimed to first introduce this increasingly investigated concept with its theoretical framework to the Turkish researchers, and then, systematically review the main findings in this area.

Description of Sensory Processing Sensitivity

SPS (Aron & Aron, 1997) is an inherent temperamental trait which is characterized by deep cognitive processing of physical (i.e., noise, light) as well as emotional (i.e., other people's moods and emotions) stimuli (Aron, Aron & Jagiellowicz, 2012). Highly sensitive people recognize subtle details and changes more quickly, are easily overwhelmed by strong stimulations (e.g., bright lights, strong smell, loud noise), and show heightened emotional reactivity towards positive and negative situations (Aron & Aron, 1997; Aron et al., 2012). There are four basic features that distinguish SPS from other temperament traits (Aron, 2011; Aron et al., 2012); (1) deep sensory processing, (2) behavioral inhibition, (3) overstimulation, and (4) emotional/physiological reactivity.

The theoretical framework of SPS has been established within the personality research from an evolutionary perspective. Animals have developed specific temperament traits to keep up with nature and to survive in harsh conditions. These temperament traits are shaped

by the joint effect of environmental conditions and survival strategies. For example, while some animal species in threatening and novel situations tend to be highly cautious and vigilant for potential dangers and novelty, others in safe environments can be bold and unresponsive (Wilson, Coleman, Clark & Biederman, 1993). Aron et al. (2012) hypothesized that similar variations are also observed in humans and best described by the SPS trait.

Characteristics of Highly Sensitive People

Since highly sensitive people have low sensory threshold, they perceive and process information faster than those with low sensitivity. Highly sensitive people pause and then process information deeply before getting into an action so as to prevent potential danger and negativity. This is called typical "pause to check" type of behavior (Aron & Aron, 1997; Aron et al., 2012). This is why highly sensitive people who have a deep and complex inner life than those with low sensitivity are delighted by fine arts and music (Aron, 2004; Aron & Aron, 1997)

Measurement of Sensory-Processing Sensitivity

Aron and Aron (1997) developed a 27-item "The Highly Sensitive Person Scale" (HSPS) for the measurement of the SPS in six subsequent studies. Scale items cover various sensory sensitivity indicators such as being overwhelmed by strong stimulations such as noise, and bright light, easy startle, overstimulation during multitasking, and being delighted by aesthetic values. The researchers using the HSPS found that the scale had a one-factor structure (Hofmann & Bitran, 2007; Neal, Edelmann & Glachan, 2002). However, subsequent studies found an evidence for two (Evans & Rothbart, 2008), three (Smolewska et al., 2006), and four (Meyer, Ajchenbrenner & Bowles, 2005; Şengül-İnal & Sümer, 2017) factorial structure for the scale.

Empirical Research on SPS

Studies on SPS were reviewed in Web of Science, PsycARTICLES, PsycINFO and EBSCOhost databases by using following keywords; (1) 'sensory processing sensitivity', (2) 'sensory sensitivity', and (3) 'highly sensitive people'. The results obtained were elaborated under six broad headings; (1) personality trait findings, (2) negative psychological findings, (3) psychological well-being findings, (4) neuroscience and genetic findings, (5) trait-environment interaction findings, and (6) other findings on SPS.

Personality Trait Findings

The research findings showed that SPS is systematically and moderately strongly associated with neuroticism, introversion, and openness (Ahadi & Basharpour, 2010; Grimen & Diseth, 2016; Licht, Mortensen & Knudsen, 2011; Smolewska et al., 2006; Sobocko & Zelenski, 2015; Şengül-İnal, Kırimer-Aydınlı & Sümer, 2018) and harm avoidance (Hofmann & Bitran, 2007; Licht et al., 2011). Moreover, the findings indicated that there is a strong relationship of SPS with behavioral inhibition sensitivity, but a weak one with behavioral activation (Smolewska et al., 2006; Sobocko & Zelenski, 2015).

SPS and Negative Psychological Outcomes

A number of studies have found a significant relationship between SPS and high levels of stress and anxiety (Ahadi & Basharpour, 2010; Bakker & Moulding, 2012; Gearhart & Bodie, 2012; Kjellgren, Lindahl & Norlander, 2009; Liss, Timmel, Baxley & Killingsworth, 2005; Meredith, Bailey, Strong & Rappel, 2016). SPS was also positively associated with rejection anxiety (Meyer et al., 2005) and attachment anxiety (Meredith et al., 2016; Şengül-İnal et al., in press).

SPS and Psychological Adjustment

SPS has been closely associated with agoraphobia, which is defined as a fear of being in closed and crowded places (Meyer & Carver, 2000; Neal et al., 2002), avoidant and borderline personality disorder (Meyer et al., 2005), social functioning disorder (Ahadi and Basharpour, 2010) and depression (Liss et al., 2005; Liss et al., 2008; Bakker and Moulding, 2012; Brindle et al., 2015; Meyer et al., 2005; Ahadi and Basharpour, 2010). Apart from current psychological well-being symptoms, high sensitivity was also related to higher scores on perceived ill-health report (Benham, 2006).

Neuroscience and Genetic Findings

Because SPS is an inborn characteristic like other personality and temperamental traits, researchers are

interested in investigating its biological underpinnings. The evidence obtained from functional magnetic resonance imaging (fMRI) studies showed that highly sensitive individuals are more attentive to subtle sensory stimuli during the performance of visual-detection task (Aron et al., 2010) and less likely to be affected by the culturally relevant contexts (Jagiellowicz et al., 2011). Highly sensitive people show more neural responses in the brain regions responsible from sensorimotor activities when exposed to subtle and self-referential emotional stimuli (e.g., Acevedo et al., 2014). Furthermore, Chen and his colleagues (2015) found that these brain regions are more active even when the person is deprived of any cognitive load. Genetic studies, on the other hand, suggested that SPS is related to serotonin (Licht et al., 2011) and dopamine-related genes (Chen et al., 2011). Overall, reviewed studies have demonstrated that SPS has a strong link with specific neural responses and genes that evidently distinguish highly sensitive and non-highly sensitive individuals.

Trait-Environment Interaction Findings

Studies on gene/trait-environment interaction suggest that some individuals are genetically more sensitive or developmentally more responsive and flexible to negative and positive environmental effects as a function of their specific genetic makeup. Gene-environment interaction studies have introduced three basic approaches to explain human developmental plasticity: *Diathe-sis-Stress Model* (Monroe & Simons, 1991) which represents biological vulnerability to adverse environmental effects, *Differential Susceptibility Hypothesis* which represents individual responsivity to both positive and negative environmental effects (Belsky & Pluess, 2009), and *Vantage Sensitivity* (Pluess & Belsky, 2012) which refers to exclusive responsivity to positive experiences.

Given that highly sensitive people have specific genetic variant (i.e. 5-HTTLPR and DRD2) influencing human plasticity, studies have provided empirical evidence on how SPS supports gene-environment interaction. For example, Aron, Aron and Davies (2005) investigated the interplay between SPS and environmental factors in four subsequent studies and found that highly sensitive individuals with negative childhood history reported more shyness than those with low sensitivity. Pluess and Boniwell (2015) investigated the SPS trait as a plasticity marker for economically disadvantaged school girls, and found that those with high sensitivity benefit more from school intervention program by displaying lower level of depression than those with low sensitivity. These findings suggest that SPS is an important personality trait that supports the notion of gene-environment interaction (see Homberg, Schubert, Asan and Aron, 2016).

Other Findings

This section aims to present the findings of studies, in which SPS was found to have a potential for influencing different life domains, such as work, home, sociality, and spirituality. Extant studies showed that SPS is related to work alienation, and work stress, and lack of sense of cohesion (Evers et al., 2008). Concerning the home context, Wachs (2013) investigated whether SPS moderated the relationship between the actual and perceived home chaos by mothers, and found that mothers with high sensitivity perceived home organization as more chaotic than those with low sensitivity. With regard to communication skills, Gearhart and Bodie (2012) found that a higher score on the sensitivity trait was associated with greater communication apprehension. Researchers also investigated the link between SPS and spiritual experiences, and found a positive association between SPS and parapsychological experiences such as altered state of conscientiousness and mystical states (e.g., Irwin, Schofield & Baker, 2014; Jonsson, Grim & Kjellgren, 2014; Kjellgren, Lindahl & Norlander, 2009).

General Discussion and Suggestions

The aim of this article was to review empirical studies on SPS, and to introduce the main findings to Turkish researchers. The major empirical findings of the SPS were reviewed, classified, and summarized under six sub headings.

Given the summarized research findings, it appears that SPS is mainly associated with negative vari-

ables such as anxiety, stress, or psychological disorder symptoms. It was speculated that negative psychological outcomes such as anxiety and stress may indeed be functional for highly sensitive people and serve as an early alarm system by constantly keeping them alert and protecting them from the potential emotional negativity and environmental adversity. Lack of empirical studies on the advantages of SPS is noteworthy. Aron (2004) and Zeff (2015) point out that SPS has many advantages such as the fact that highly sensitive people are more creative than non-sensitive people, have more advanced sense and emotional perception skills, better ability to empathize and a higher sense of responsibility and conscientiousness.

It was concluded that the SPS literature is limited on two important points. The first limitation is that SPS has not been examined in cross-cultural comparative studies. The second limitation is that SPS has not been examined in the context of close relationship dynamics. The research on the factor structure of HSPS showed that there are inconsistent findings on its factor structure. Different factorial structures of the scale make it difficult to compare the study findings and make consistent inferences.

Overall, this paper has contributed to Turkish psychology literature by providing in-depth and up-to-date review on the SPS trait. Future researchers should examine the dynamics of SPS in the Turkish culture and further explore its functionality in both intraindividual and interindividual processes.