

# TIPS FOR SPS RESEARCH (Revised November 21, 2013)

(From E. Aron & A. Aron)

Dear Fellow Researcher,

Thank you for your interest in conducting research on sensory processing sensitivity (which should not be confused with “Sensory Processing Disorder.”)

First, you might want to look at a recent literature review (Aron et al., 2012). Also, relevant research as it is published is noted at [www.HSPerson.com](http://www.HSPerson.com), research tab.

**Here are some tips you may find useful when doing research on SPS:**

## STANDARD 27-ITEM HSP SCALE

The 27 items of the standard HSP Scale are shown in Aron & Aron (1997), Table 1. (NOTE: This is **not** the same as the true-false “self-test” on the web site, which is not intended for research purposes.) All items are scored in the same direction (there are no reverse items). Standard instructions and 7-point scale are as follows:

INSTRUCTIONS: This questionnaire is completely anonymous and confidential. Answer each question according to the way you personally feel, using the following scale:

1	2	3	4	5	6	7
<b>Not at All</b>			<b>Moderately</b>			<b>Extremely</b>

## SHORT SCALES:

- a. If you need a **very short scale**, below are what we think are the six best items that directly assess the basic construct of sensory processing sensitivity. (And they are also the ones that have the least correlation with negative affectivity or neuroticism):

- I seem to be aware of subtleties in my environment
- I have a rich, complex inner life
- I am deeply moved by the arts or music
- I am conscientious
- When people are uncomfortable in a physical environment, I tend to know what needs to be done to make it more comfortable (like changing the lighting or setting).
- I notice and enjoy delicate fine scents, tastes, sounds, works of art

- b. Here is a **12-item version** (developed in collaboration with Michael Pluess) that has more diversity of items:

- Do you seem to be aware of subtleties in your environment?
- Are you easily overwhelmed by things like bright lights, strong smells, coarse fabrics, or sirens close by?
- Do you have a rich, complex inner life?
- Do you get rattled when you have a lot to do in a short amount of time?
- Are you deeply moved by the arts or music?
- Are you annoyed when people try to get you to do too many things at once?
- Do you make a point to avoid violent movies and TV shows?
- Do you find it unpleasant to have a lot going on at once?
- Do changes in your life shake you up?
- Do you notice and enjoy delicate or fine scents, tastes, sounds, works of art?
- Are you bothered by intense stimuli, like loud noises or chaotic scenes?
- When you must compete or be observed while performing a task, do you become so nervous or shaky that you do much worse than you would otherwise?

## SCALE FOR SCHOOL-AGED CHILDREN:

The same type of self-report scale with simpler language for each item exists in a 12-item and longer form, now in several languages. You will have to judge whether your sample can use it. Until this scale is published (hopefully soon) please contact Michael Pluess [m.pluess@qmul.ac.uk](mailto:m.pluess@qmul.ac.uk) for the latest versions of this.

## CONTROLLING FOR NEGATIVE AFFECTIVITY

Even if using only the 6-item scale, and especially if using the 12-item or entire scale or any other subset, it is almost always best to control for state negative affectivity. (The major exception would be if you are testing an interaction of SPS with early childhood experiences.) This partialing out of negative affectivity is because many of the HSP Scale items have negative affect involved, which was intended to capture the reports of sensitive persons that they are especially bothered by certain things. But this negative affect can also be the result of neuroticism. To partial out neuroticism, you can use a standard Big-5 Neuroticism scale or any short measure. We have a three-item measure we often use that correlates well with other measures and gets directly at the key ideas. The items are: “Are you a tense or worried person by nature,” “Are you prone to fears?” and “Are you prone to depression?” (In fact, even a two-item version without the “Are you prone to fears” works quite well.) Or you might want to use instead the Beck depression inventory on its own (as in Liss et al. 2005). By focusing on the depression aspect of neuroticism, you avoid anxiety items, which may be a problem because sensitive persons do look ahead to possible consequences, giving them another reason to seem anxious.

## CONSIDER DICHOTOMIZING YOUR SAMPLE WHEN CONDUCTING ANALYSES

When analyzing results, you may find the clearest pattern if you dichotomize the sample into HSPs (high on SPS) and non-HSPs, taking as your high-low break point somewhere between 15% for HSPs and 85% for not HSPs, up to 30% for HSPs and 70% for not HSPs. In some cases you might see a visible break point in the distribution or you might decide more by the nature of the sample—psychology majors might be a bit higher in % HSPs, career military, a bit lower.

In a taxometric analysis study with human infants (Woodward et al., 2000) of what is probably the same trait, the breakdown was 10-90.

A 2012 dissertation at University of Bielefeld, Germany, by F. Borries (franziskaborries@gmx.de) investigating the latent structure of the HSP Scale found evidence for SPS being a taxon (a two-category variable, not a continuous dimension) with 17.5% HSPs and 82.5% not HSPs.

For an evolutionary explanation of why the trait of sensitivity or responsiveness in any species will always be found only in a minority, see Wolf et al. (2008). However, because the HSP Scale (like any questionnaire measure) will have lots of noise (especially if negative affectivity is not partialled out, but to some extent even if it is), you may want to include at least 20% as HSPs in order not to miss them.

If you think about it, treating SPS as a continuous variable means that most of your results will be based on the variance among the 80% or so of people who are not highly sensitive. For example, for 80% of people, agreeing to being bothered by having a lot going on around them could have many other causes.

## ABOUT GENDER DIFFERENCES

There appear to be no differences in the number of males and females born with this trait, and only those items that showed no significant gender difference in our initial samples were included in the HSP Scale. Yet men tend to score lower than women on the Scale itself. Given that this appears to be a genetic trait, we suspect this gender bias is for cultural reasons, and unless that is your specific interest, we suggest not making too much of correlations with gender. (Although, it may be eventually be found that the trait interacts in interesting ways with male physiology.) Thus, you may also want to consider controlling for gender in your major analyses.

## EXAMPLE *M*s AND *SD*s FOR THE FULL SCALE FROM SOME PREVIOUS SAMPLES

- In US student sample (Stony Brook University undergraduates in introductory psychology;  $N=904$ ; 58% female):  $M=4.09$ ,  $SD=.83$
- In US community sample of married couples (comparable to several other community samples;  $N=76$ ; 50% female):  $M=3.96$ ,  $SD=.71$
- In German community sample ( $N=898$ ; 73% women):  $M=4.54$ ;  $SD=.94$  (Female  $M=4.67$ ; Male 4.20)

## SOME IMPORTANT CONCEPTUAL ISSUES TO CONSIDER WHEN EVALUATING RESULTS

- We see SPS as an innate strategy to process information thoroughly (not necessarily consciously) before acting, as opposed to a strategy of acting quickly without much processing. Sensitive or reflective versus bold or impulsive. Thus it is a normal variation in human temperament (a variation found in many if not most other species) that has advantages and disadvantages as a function of the environment.

- This fits with findings that those high in SPS tend to respond more intently or intensely (leading to more thorough processing) to all stimuli and situations—from facial expressions to work environments—and whether the stimuli are positive, negative, or neutral. They also are more aware of subtle differences. If you study the effect of high SPS on responses only to negative stimuli, such as stressful situations, or look for associations of it with only negative variables, such as stress or anxiety, you may be misled into thinking high SPS creates only increased negative affect and psychological vulnerability. (See Belsky et al., 2009; Pluess & Belsky, 2013.)
- However, given this more intense and thorough processing of all experience, those high in SPS are more affected developmentally by their childhood environment. Although anyone with a bad childhood is more likely to show problems as an adult, this will be even more true for those high in SPS. (See Aron et al., 2005.)
- It is also likely that those high in SPS and coming from a particularly good environment are even more benefitted by it. See Aron et al (2005, Study 4); Belsky et al. (2009); and also Ellis et al. (2006) and Pluess & Belsky (2013).
- SPS is mostly about sensory **processing** sensitivity. It is not simply sensory sensitivity. It does not imply better eyesight, for example, or that it necessarily has specific effects on primary sensory responses. There does appear to be a greater sensitivity to pain and a stronger reaction to loud noise or “bad” smells, things others might not notice or not be bothered by. If there is sensory overload, it comes from having too much to process at once, not from painfully keen hearing, for example. The hearing difference would be in the processing. Thus a person high in SPS might even be partially deaf yet be able to detect subtle differences in music. Those measuring and treating Sensory Processing **Disorder** (an unfortunate confusion) seem to be describing something quite different, a specific abnormality in primary sensory responses. See, for example, Dunn (1999).
- On the other hand, a closely related concept is Sensory Orienting Sensitivity (see Evans & Rothbart (2007).

**POSSIBLE FACETS OF SENSITIVITY AS SUBSCALES WITHIN THE HSP SCALE (This is a slightly updated excerpt from Aron et al., 2012.)**

Some studies (Evans & Rothbart, 2008; Myer et al., 2005; Smolewska et al., 2006) have reported subfactors within the HSP Scale that possibly measure different facets of sensitivity, or at least point to subfactors in the scale. In the studies that have reported the eigenvalues for the first several factors, results have all been very similar, with a very large first eigenvalue (e.g., 26% of variance in the 27 items accounted for by a single factor of around 12 items) and the second factor, substantially lower (e.g., 8% or less), the rest dropping gradually to 0. However, in some studies, the second and third were interpreted as indicating that there may be three (Ease of Excitation, EOE; Aesthetic Sensitivity, AES; and Low Sensory Threshold, LSL; Smolewska et al., 2006) or even four (Meyer et al., 2005) subfactors of the overall HSP Scale. Still, as Smolewska et al. note, “The positive intercorrelations among these factors, however, are consistent with a general, higher-order construct of SPS” (p. 1,276).

Evans and Rothbart (2008), using a different method of identifying the number of factors (a version of parallel analysis), found support for both two- and three-factor solutions (the latter similar in content to Smolewska et al., 2006), but argued for a two-factor solution based on the match of the content of these two factors to aspects of temperament measured in their Adult Temperament Questionnaire (Evans & Rothbart, 2007). Specifically Evans and Rothbart’s first HSP-Scale sub-factor corresponded to (and correlated with) their Questionnaire’s “Sensory Discomfort” subscale, a trait of negative affect. Their second HSP-Scale sub-factor correlated with their Questionnaire’s “Orienting Sensitivity” subscale, which has items reflecting what we would call noticing subtleties and depth of processing.

In two recently collected large data sets (A. Aron & E. Aron, 2010), when we forced two- and three-factor solutions, we obtained quite similar patterns to those of Smolewska et al. (2006) and Evans and Rothbart (2008). The first of the three factors Smolewska et al. termed Ease of Excitation, but in both theirs and our own first factor, the four strongest items are about disliking being rushed (e.g., “Do you get rattled when you have a lot to do in a short amount of time?” and “Are you annoyed when people try to get you to do too many things at once?”), suggesting the factor comes closer to a negative version of preferring to observe and reflect before acting. However, it also might be the result of there happens to be four items in the HSP Scale that asked almost the same question, which for mathematical reasons could create a strong factor without necessarily reflecting its unique importance to the overall trait.

More generally, as noted, results of factor analyses have been somewhat inconsistent. Indeed, Liss et al. (2008) confirmatory factor analysis found that both two- and three-factor solutions comparable to previous studies had only marginal fits (e.g., respectively, RMSEAs of .08 and .07; CFIs of .78 and .81).

If there are different facets to an overall trait of sensitivity, this would not be surprising, given the wide range of item content. Indeed, we think there are at least the four we described in the previous main section (inhibition of behavior, sensitivity to stimuli, etc.). However, the scale was not designed to tap facets having theoretical construct validity, and we are cautious about drawing strong conclusions from the factor analysis procedures because results have been inconsistent across samples and methods as to whether there are one or more factors. In addition, the straightforward application of standard factor analysis methods to the HSP Scale is problematic for several technical reasons:

1. The distribution of HSP Scale scores is non-normal (perhaps due to negative frequency, Wolf et al., 2008) and in fact probably dichotomous in humans (see section above on dichotomizing HSP Scale scores). Thus factor analyses may be mostly based on the 80% or so of the population who are probably not at all highly sensitive.
2. The apparent two or more facets in some studies may actually be artifacts of gender differences in preference for some of the items in Smoleska et al.'s Aesthetic Sensitivity factor as well as the similar factor Evans and Rothbart call Orienting Sensitivity (e.g., "enjoying fine scents, tastes, etc."; "other people's moods affect you").
3. There may be differential correlations of items with negative affectivity (due to the robust interaction with childhood experience described above and the question of why a trait of negative affect by itself would be supported by evolution).
4. There is a likely differential effect of self-report bias on different facets (e.g., being conscientious and having a "rich, complex inner life" in Smoleska et al.'s Aesthetic Sensitivity and Evan & Rothbart's Orienting Sensitivity factor in their analysis of the HSP Scale seem especially vulnerable to social desirability). Future research will help sort out this issue, perhaps with factor analyses specifically addressing some of these technical issues.

Best of luck with your research,

Elaine and Art Aron

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