BioHealth LABORATORY *Quality First.*

The Perceived Stress Scale and HPA Assessment

As the field of functional medicine enjoys great advancements in understanding how to use salivary hormone testing to measure cortisol awakening response (CAR), diurnal cortisol rhythm, cortisol to DHEA-S molar ratios, and more, a survey tool well-established in the field of psychology is finding its way into the mix. BioHealth is the only laboratory integrating this powerful diagnostic tool, the Perceived Stress Scale (PSS) survey, into the interpretation and reporting of HPA axis lab assessments.

What is the PSS?

The Perceived Stress Scale is a way to quantify perception of stress. Originated by Dr. Sheldon Cohen in 1983, this 4, 10, or 14 point questionnaire assesses how in control of their lives subjects have felt over the last month. In general, subjects under high levels of perceived stress will have increased HPA activation. However, if stress is chronic in nature, the HPA axis may down regulate to an extent that one may experience "burnout," defined as feeling exhausted, listless, and unable to cope.

High scores on the PSS have been associated with biological aging (Epel et al.,2004), higher levels of cortisol (Pruessner, Hellhammer, and Kirshbaum,1999), suppressed immune function (Burns, Drayson, Ring and Carroll, 2002) greater infection-induced release of pro-inflammatory cytokines (Cohen, Doyle, and Skoner, 1999), and slower wound healing (Ebrecht et al., 2004).

Higher scores have also been correlated with poor lifestyle habits such as skipping breakfast, greater alcohol consumption, and insufficient sleep (Cohen and Williamson, 1988). Although high scores have been associated with adverse health effects, the PSS itself does not have hard and fast scoring cut-offs for low, medium and high stress. However, large studies were done correlating demographics and the PSS in 1983, 2006 and 2009, and we'll be discussing how we suggest using that data later in this article.

Perceived Stress, especially related to finances (employment in particular) has a large effect on the production of cortisol. Although diurnal cortisol rhythm and total output may give some indication of levels of perceived stress, it is best reflected by looking at the Cortisol Awakening Response (CAR). The use of the PSS along with lab assessment that evaluates diurnal cortisol rhythm, cortisol awakening response, and DHEA-S, may be the optimal way to determine HPA health outside of a controlled research setting.

It's important to remember that the human stress response was designed to help us deal with danger. Unfortunately, it cannot distinguish between real threats and imagined or perceived ones. Since the physiological reaction and the effect on the HPA axis is the same, regardless of source(s), being able to see the effects that high levels of mental and emotional stress (using PSS) are having on HPA axis function (notably the CAR), is essential in designing a treatment plan that will yield lasting results.

PSS Means for Sex, Age, Race, Education, Employment and Income (2009)

Dr. Cohen did 3 studies measuring PSS and correlating them to 6 demographics, each involving ~2000 people in the years 1983, 2006 and 2009. He found almost identical distributions of stress across all 3 time periods. Interestingly he found that in general women had more stress than men and stress decreased with increasing age, income and education. While minorities tended to have more stress, once one controlled for education, income and employment they had similar scores to non-minorities.

We've supplied the data from Cohen's most recent study (2009) so that one can see the mean value for each of several categories: sex, age, race, education, employment and income (Table 1). The income category is in 2009 dollars but can be adjusted to 2016 dollars by multiplying by 111%. By taking the mean PSS from each category where a particular patient would fall, for example, a 42 year old white female with a part-time job, some college and making $50,000 annually, and averaging those figures, one can come to an approximation of the average stress score for that patient's particular demographics.

In the example we give above, the breakdown of PSS score means for each category is as follows; Woman: 16.14, 35-44 years old: 16.38, White: 15.70, Some College Education: 16.00, Part-time Employment: 15.32, Income: 16.37 Those particular demographics would have a mean (average) score of 16.0. The average standard deviation across the data was 7 points therefore we use 7 point intervals and can look at people as having a low, medium or high level of perceived stress. While this approach to scoring patient survey scores is not well-established in scientific literature, we believe this kind of thinking has great value in refining the assessment of how to prioritize mental and emotional therapies in the context of a treatment plan.

Perceived Stress Scale (PSS) Means for 2009 National Survey

Sex	Mean
Men	15.52
Women	16.14

Age (in years)	Mean
Less than 25	16.78
25-34	17.46
35-44	16.38
45-54	16.94
55-64	14.50
65 and older	11.09

Race	Mean
White	15.70
Black	15.68
Hispanic	17.00
Other	17.44

Education	Mean
Less than high school	19.11
High School	16.59
Some College	16.00
Bachelors Degree	15.17
Advanced Degree	14.65

Employment	Mean
Full-time	16.23
Part-time	15.32
Unemployed	16.62
Retired	12.34
Homemaker	15.79
Other	18.99

Income	Mean
$25,000 or less	17.77
$25,001-$35,000	16.69
$35,001-$50,000	16.37
$50,001-$75,000	15.26
F$75,001 or more	14.74

Table 1. Perceived Stress Score (PSS) averages across various categories. (Cohen & Janicki-Deverts, 2012)

PSS Scores and Cortisol Awakening Result Examples

High PSS

Although an elevated or blunted CAR can tell us key information, regardless of CAR, it is important to further investigate the specific causes of mental and emotional stress as a high score on the PSS is mostly likely either having, or going to have, negative effects on the HPA.

High PSS and Elevated CAR:

High levels of perceived stress typically result in increased HPA activation. If an elevated CAR is seen in someone with a high score on the perceived stress scale there is a good chance that the daily challenge of keeping up with life is affecting their HPA function negatively.

High PSS and Normal CAR

In these cases, it is still important to investigate causes of emotional and mental stress. However, if the HPA dysfunction has not yet progressed to the point where CAR levels are being affected, meaning that metabolic reserves are still strong.

High PSS and Blunted CAR

This is indicative of a down regulation of the HPA and appears in those suffering from burnout. Typically these patients will have very little motivation, low self-esteem and a difficult time getting through the day.

Average PSS and Elevated CAR

In this case it is still important to investigate causes of emotional and mental stress. It is common for ovulating women and patients with sleep issues or depression to have elevated CAR levels.

Average PSS and Normal CAR

While this may be the profile of a healthy patient, especially if diurnal cortisol, total cortisol output, and DHEA-S levels are within reference ranges, one still needs to rely on diagnostic and history taking skills, in addition to all available diagnostic data to determine the appropriate course of action.

Average PSS and Blunted CAR

In this case it is still important to investigate causes of emotional and mental stress. Blunted CAR is also often present in PTSD, seasonal affective disorder, sleep apnea, and sometimes just caused by a poor night of sleep.

Low PSS and Elevated CAR or Blunted CAR

In cases of low PSS, there is usually not much reason to delve into deep conservations about emotional and mental stress. In these cases one can assume that elevated or blunted CAR levels are due to conditions other than perceived stress.

Most Common Reasons for High Perception of Stress

Finances

Most people have experienced the angst and worry that money, or lack thereof, can cause. Even though stress can affect all levels of income earners, typically it is higher in those with low incomes (although there are certainly exceptions). While a clinician isn't necessarily the right person to talk to about finances, they can refer their patient to a certified financial planner. Getting control of monthly budgets and creating a manageable plan to pay off debt can have a great benefit on one's management of stress.

Relationships

Nothing can cause highs or lows in life like relationships. From the high of new love to the anguish of losing a partner, relationship stress can greatly affect the health of the HPA. Unless someone presents with low levels of perceived stress it is wise to use one of a variety of questionnaires to determine relationship stress. Death, divorce, bedroom issues, and caregiving can all profoundly contribute to perceived stress and should be understood to the extent possible.

Job Stress

Job stress can be difficult to control. However, if possible, helping to shape a work environment where new tasks are introduced in a manner as to not be unpredictable can help control feelings of stress. Additionally, using all vacation days (something most Americans don't do) is something everyone should do to help resist the effects of work related stress. Also, courses on communication to help deal with difficult coworkers or peers should be considered.

Final Words

While BioHealth is the only functional medicine lab currently offering CAR testing and PSS surveys, our hope is that the industry will catch up, moving this research-based approach to HPA axis assessment towards a global standard. It's clear from the increasing abundance of literature and discussions about lab assessment for stress response disorders, that the value of CAR testing and assessment of mental and emotional stress as it pertains to treatment of HPA dysfunction has the potential to significantly improve patient health.

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